Accident Report
BATTLEMENT CREEK FIRE
Fatalities & Injury
July 17, 1976

US Department of the Interior
Bureau of Land Management
State of Colorado
Grand Junction District

ACCIDENT REPORT

BATTLEMENT CREEK FIRE
FATALITIES AND INJURY
JULY 17, 1976

U. S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
STATE OF COLORADO
GRAND JUNCTION DISTRICT

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FOREWORD

This investigation report covers an accident which occurred July 17, 1976, in the Grand Junction District of the Bureau of Land Management (BLM) in Colorado. Three firefighters were killed and a fourth severely burned while working on the Battlement Creek fire approximately 40 miles northeast of Grand Junction, Colorado (fig. 1). All victims were members of a trained Forest Service (FS) fire crew stationed at Mormon Lake on the Coconino National Forest near Flagstaff, Arizona.

The victims were:

Anthony A. Czak, 25, Flagstaff, Arizona
Scott L. Nelson, 22, Bloomer, Wisconsin
Stephen H. Furey, 23, Salmon, Idaho

The fourth victim, although severely burned, is expected to recover fully. He is John C. Gibson, 27, of Wellsville, New York.

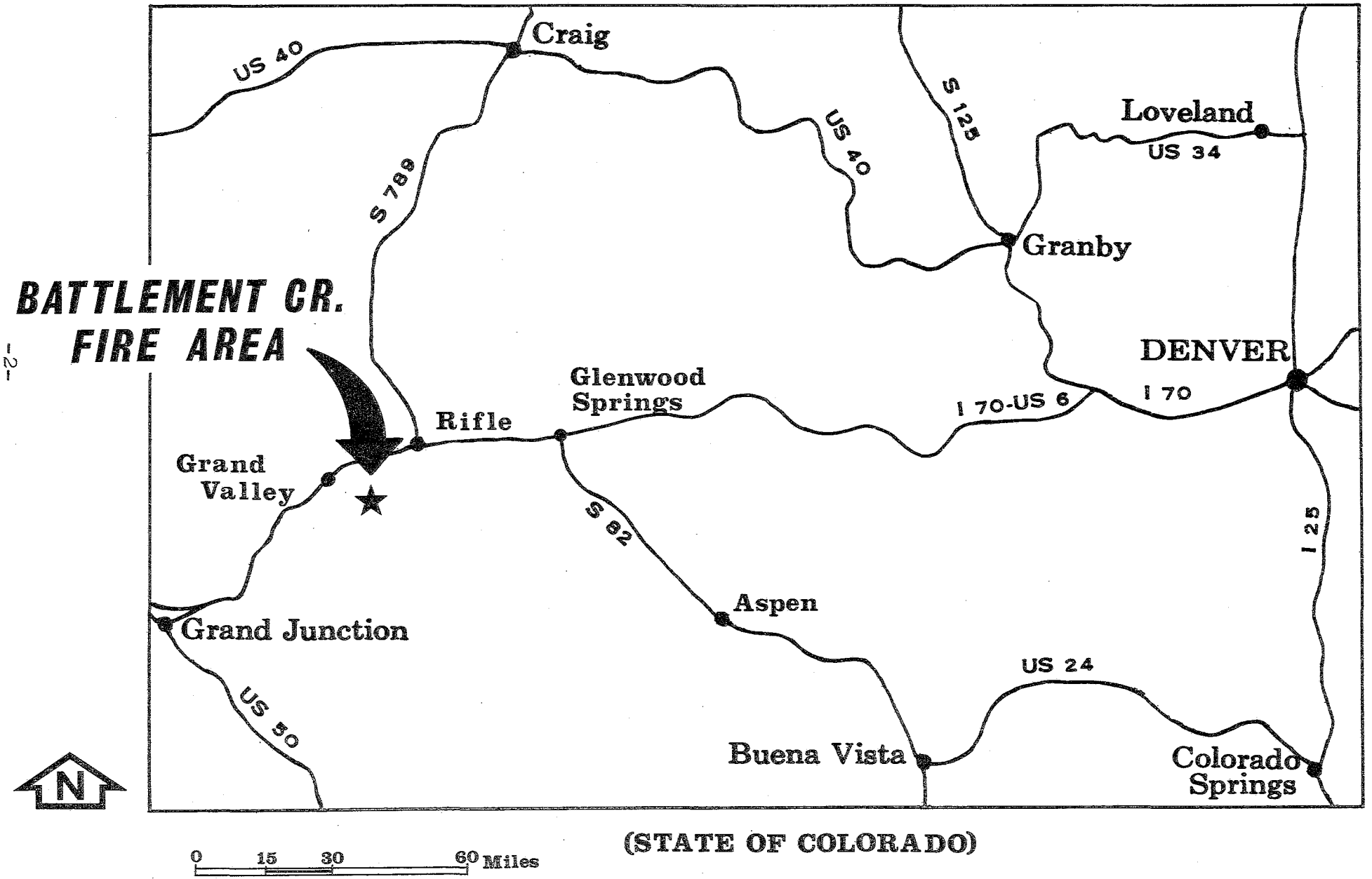
The accident occurred during a burnout operation along a ridge above the fire in a steep drainage. The crew did not recognize the danger they were in until their planned primary escape route was cut off by a run of the fire from below them. This report will discuss in depth the multiple factors which contributed to this unfortunate accident.

Although unrelated to the Mormon Lake crew fatalities, another death occurred on the Battlement Creek fire when a B-26 air tanker crashed and burned on July 16, killing the pilot. This accident is reported in a separate report.

CONTENTS

Figure 1.

VICINITY MAP



(STATE OF COLORADO)

Western Colorado is experiencing an unusually severe fire season caused partly by unusual fuel conditions and heavy lightning activity during dry weather. A severe frost on June 14, 1976, killed a high percentage of the leaves on Gambel's oak, which is now a readily available and dry fine fuel. The District has also experienced a greater number of fire starts, which has taxed their fire control capability in the past few weeks.

Under a national plan to exchange and utilize manpower and equipment, the Forest Service crew was working on this Bureau of Land Management fire. There were also people from the Forest Service in supervisory positions.

The Director of the Bureau of Land Management and Chief of the Forest Service appointed an interagency investigation team under the co-chairmanship of Jack Wilson, BLM, Director of the Boise Interagency Fire Center (BIFC), and Max Peterson, Deputy Chief for Programs and Legislation of the Forest Service (FS). Other team members were: Clyde O'Dell, Boise (Idaho) BIFC Fire Weather Meteorologist, National Weather Service; Ed Heilman, Director of Fire Management, Northern Region, Forest Service; Robert Mutch, Research Forester (Fire Behavior and Fuels), Northern Forest Fire Laboratory, Forest Service; James Abbott, Fire Training and Safety Specialist, Washington Office, Forest Service; and Harold Baer, Attorney, Solicitor's Office, Department of Interior, Denver.

Instructions to the team through the co-chairmen were to determine the conditions and circumstances that led to the fatalities and injury on the Battlement Creek fire.

I. EVENTS PRIOR TO ACCIDENT

A. Location

The fire occurred approximately 40 miles northeast of Grand Junction, Colorado, in the Battlement Creek drainage, Sections 11, 12, 13, 14 and 23, T7S, R95W. It consumed 880 acres in 3 days: July 15, 16 and 17, 1976. At the time of the accident, 13 crews totalling 270 men and approximately 20 overhead were assigned to the fire. (See Section I-D for initial suppression effort by the Grand Valley Volunteer Fire Department on July 11.) The Grand Junction District of the Bureau of Land Management was responsible for suppression of the fire. Fire suppression support and capability is newly organized this year around the Grand Junction Fire Center (BLM) located at Walker Field (the commercial airport) in Grand Junction. This Center serves all BLM lands in western Colorado with a complement of crews, helicopters and air tankers. The Fire Center, under Colorado State Office supervision, has 1 full-time employee, 9 seasonal employees, 2 fire management specialist assistants (detailed from BIFC), 30 trained firefighters from the San Luis Valley, Colorado, crews, and one 12-man helitack crew (detailed from the Forest Service).

B. National Fire Situation

On July 15, there were 198 fires reported on the Daily Fire Situation Report from BIFC. The majority of the fires were in California, Nevada, and Utah. The only fire requiring

interregional support was the Ishawooa fire on the Shoshone National Forest, which used air tanker No. 56 and 60 Missoula smokejumpers. Utah BLM had a large fire southwest of Salt Lake City. During this day, the Grand Junction District worked on three fires, including the Battlement Creek fire.

On July 16, the number of fires increased to 242, but more importantly extensive dry lightning occurred in California, Nevada, and Utah. The Battlement Creek fire and the Wickahoney fire in the Boise District of the BLM (1,590 acres) required mobilization of considerable resources. Initial attack forces in most areas of California and Utah were heavily taxed, but were successful in containing most of the fires.

On July 17, as an aftermath of the lightning storms the prior afternoon, 458 fires were reported, and red flag warnings were forecast in central California. Of the 458 fires, 384 of them were in California. The Battlement Creek fire was the only one drawing on BIFC support, although several large restock orders were processed through the fire warehouse from other areas.

This situation continued through Sunday, July 18, when 425 fires were reported. Again, 352 of these were in California, with Sequoia and Yosemite National Parks catching 120 of these fires. There were no major support actions from BIFC or any other caches outside the fire areas.

In brief summary, the national picture shows a fairly busy initial attack situation with few large fires materializing, and most of these not drawing on outside resources to any extent. A large supply of crews, aircraft of all kinds (except heavy helicopters), overhead, radio equipment, and fire supplies were available.

C. Fire Environment

1. Weather

The most basic meteorological conclusion that can be drawn from available meteorological data and extensive interviews with personnel assigned on the Battlement Creek fire, Saturday, July 17, is that the accident was not directly weather related; i.e., there were no thunderstorms in the immediate fire vicinity between 1400 and 1500 m.d.t. that could have produced downdrafts to affect the fire, no unusual or abnormal winds occurred attributable to accepted meteorological causes such as fronts, low level jet stream, or locally induced dust devils, etc.

At the time of the accident, the atmosphere was unstable, normal up-slope winds were occurring, winds aloft were generally light SW and ranged from 5-15 m.p.h. from 6,600 feet to 31,000 feet m.s.l.

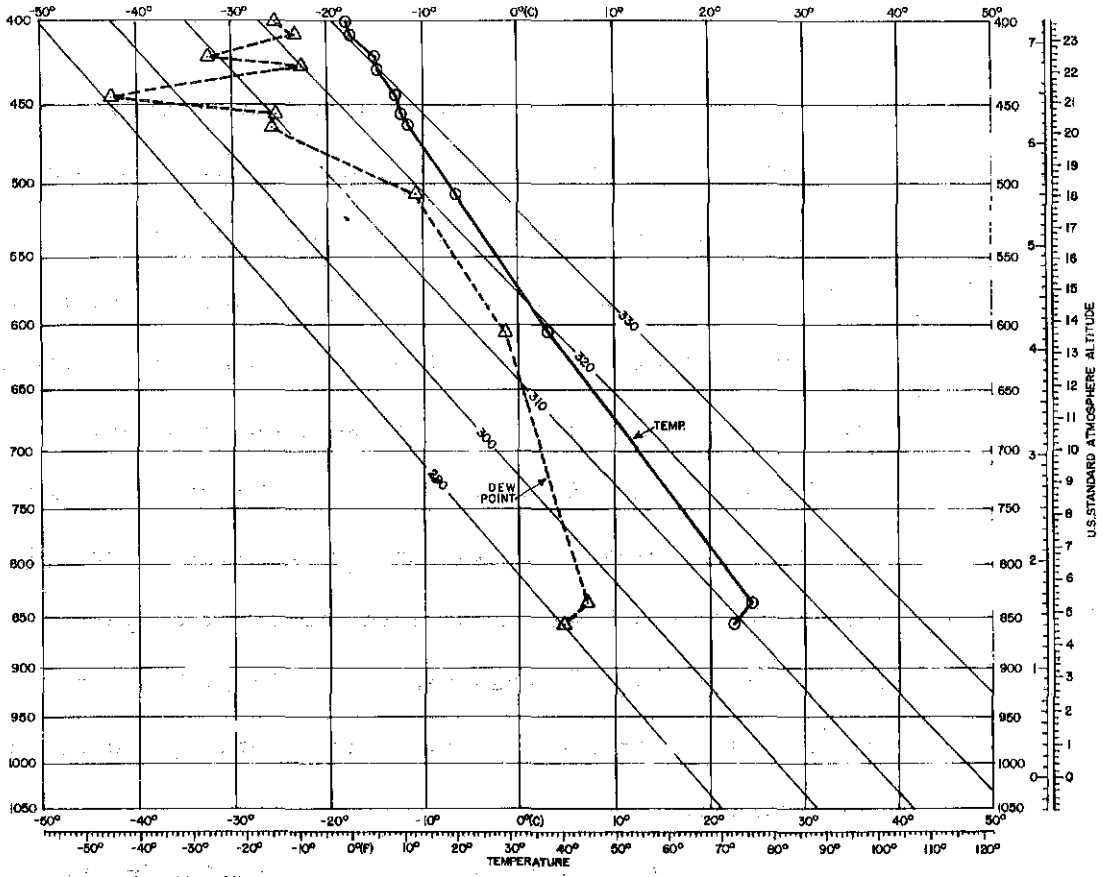
Observers on the fire at the time of the accident reported high winds at ground level 25-35 m.p.h. and above.

Earlier in the day, the weather was described as fair, winds were light both on the ridge and on lower portions of the fire. Some small whirl activity was reported about 1230-1300 m.d.t. which would indicate unstable atmospheric conditions. Figure 2 illustrates the morning and afternoon soundings for Grand Junction, Colorado, on Saturday, July 17, 1976. They illustrate typical summertime conditions of afternoon low-level heating and instability. Generally observers reported high winds at the time of, or just before, the accident. These were very likely local fire-induced winds generated by very intense burning and rapid rate of spread.

A rather severe frost on June 14 (23-27°F. in the 6,200-9,000-foot range) produced extensive damage to Gambel's oak stands in the fire area. The frost was an important indirect weather-related event which increased the dry fuel available for combustion by killing leaves in the oak stands. Relatively warm, dry weather following the frost provided conditions conducive to drying dead plant tissue.

2. Topography

Origin of the fire was 40 airline miles NE of Grand Junction, Colorado, and 1-1/2 miles south of the Colorado River in the Battlement Creek drainage. Battlement Creek is approximately 8 miles long and flows in a northwesterly


TEMP.
DEW POINT
330
320
310
300
290
TEMPERATURE
U.S.STANDARD ATMOSPHERE ALTITUDE
Station: GRAND JUNCTION, COLO.
Date: 7/17/76 12Z
6 A.M. M.D.T. 7/17/76

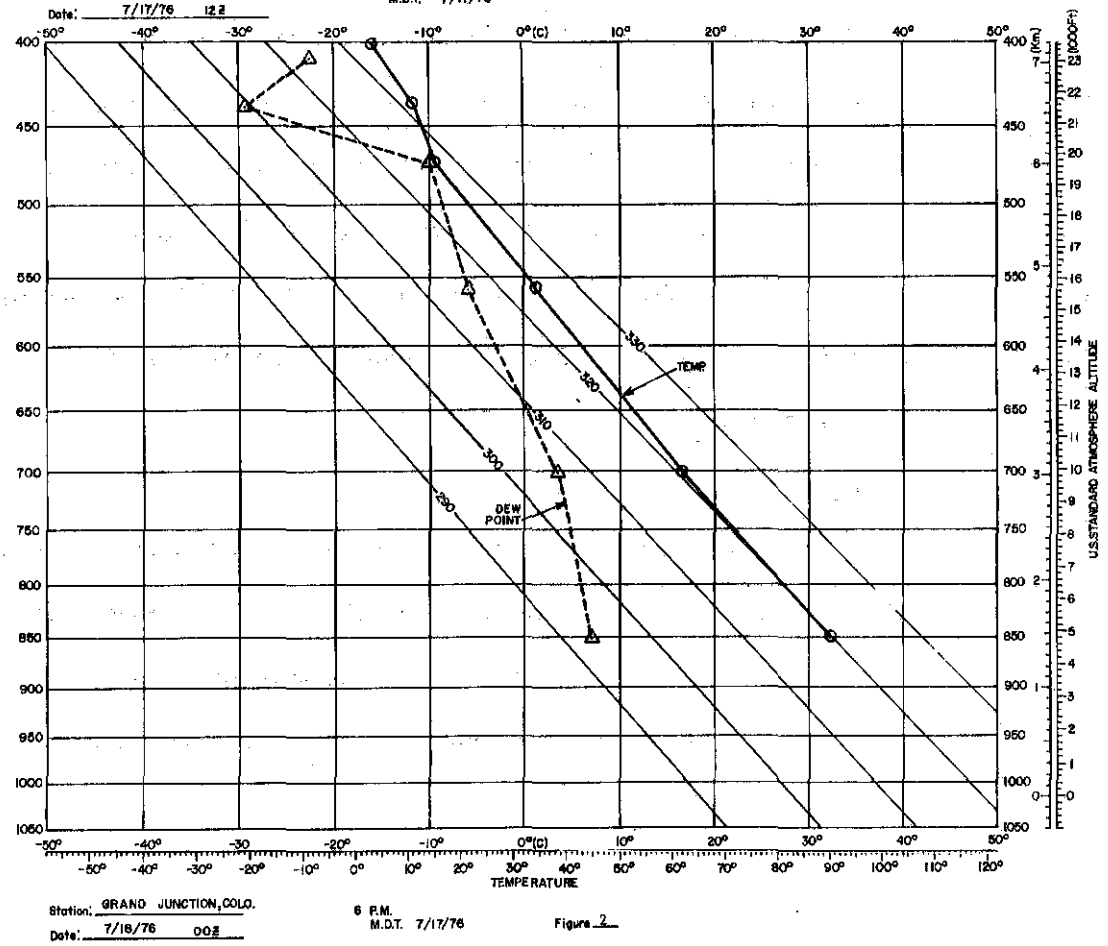

TEMP.
DEW POINT
330
320
310
300
290
TEMPERATURE
U.S.STANDARD ATMOSPHERE ALTITUDE
Station: GRAND JUNCTION, COLO.
Date: 7/18/76 00Z
6 P.M. M.D.T. 7/17/76

Figure 2

direction to the Colorado River. The fire burned entirely on the east side of Battlement Creek (fig. 3). The topography varies from relatively level land along the drainage bottom to rugged mountain slopes. Elevations on the fire range from 6,200 feet near the origin to 8,400 feet near the site where the men died. The fire burned primarily on north-facing aspects on Thursday, July 15, and Friday morning, and on west-facing aspects on Friday afternoon and Saturday. The slopes that burned on Saturday were fully exposed to prevailing southwesterly air flow; and they received direct solar heating from 1100 on. Slopes that burned on Saturday, July 17, ranged from 10 percent above the road to 75 percent in the chute just below the ridgeline. The side drainage that burned out on Saturday was characterized by two major draws, aligned in an east-west direction. The head of the north draw was about 3,500 feet northeast of the Battlement Creek road. This draw terminated just below a saddle on the ridgeline where the Mormon Lake crew was working on Saturday. The south draw climbs in an easterly direction for 3,200 feet from the road. Side slopes of these draws were measured at 50-60 percent.

Visibility to the west from the saddle above the north draw was restricted due to the topography. The slope west of the ridgetop in the saddle was gradual for about 140 feet and then broke off steeply (fig. 4).

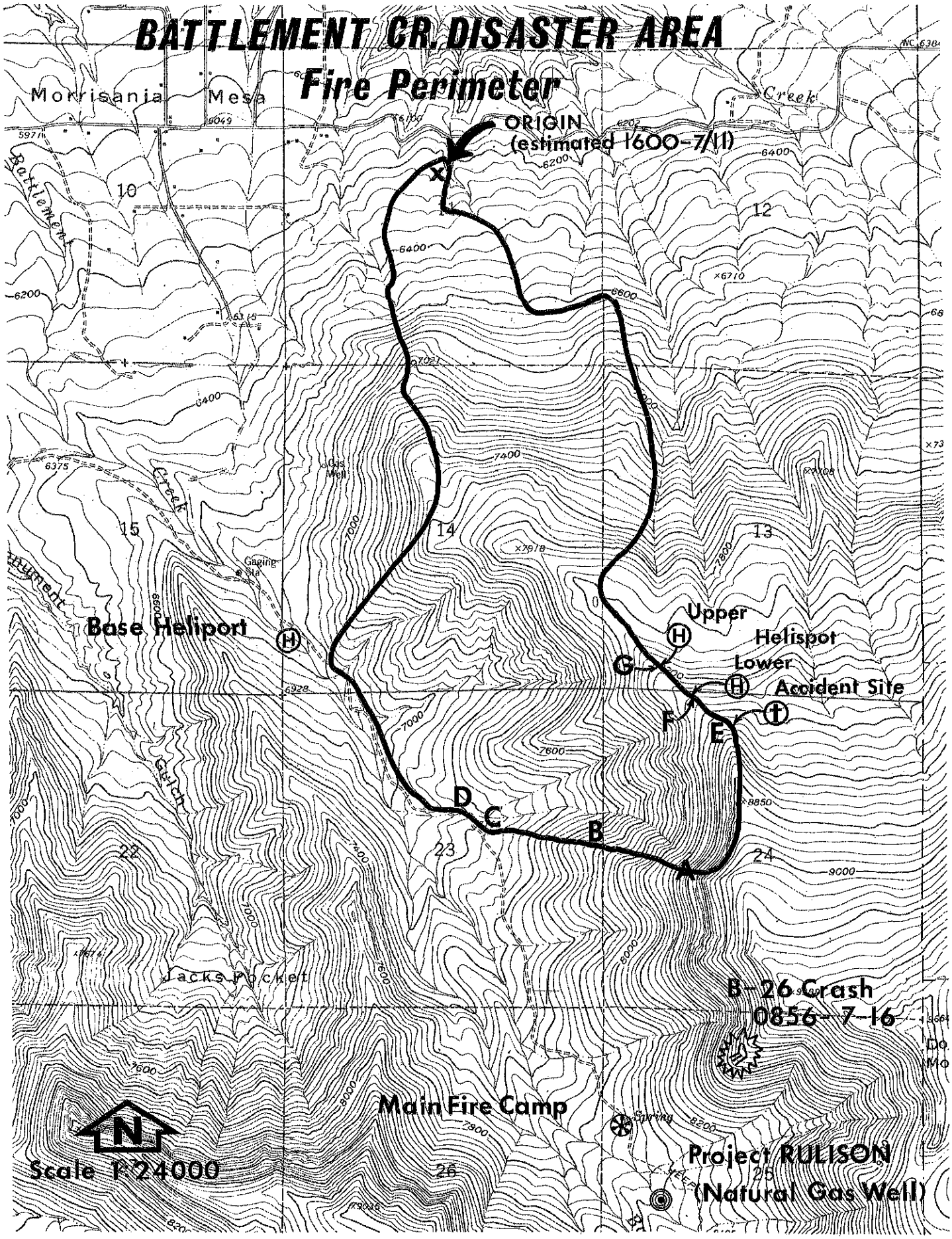


Figure 3a. Fire Perimeter and Topography

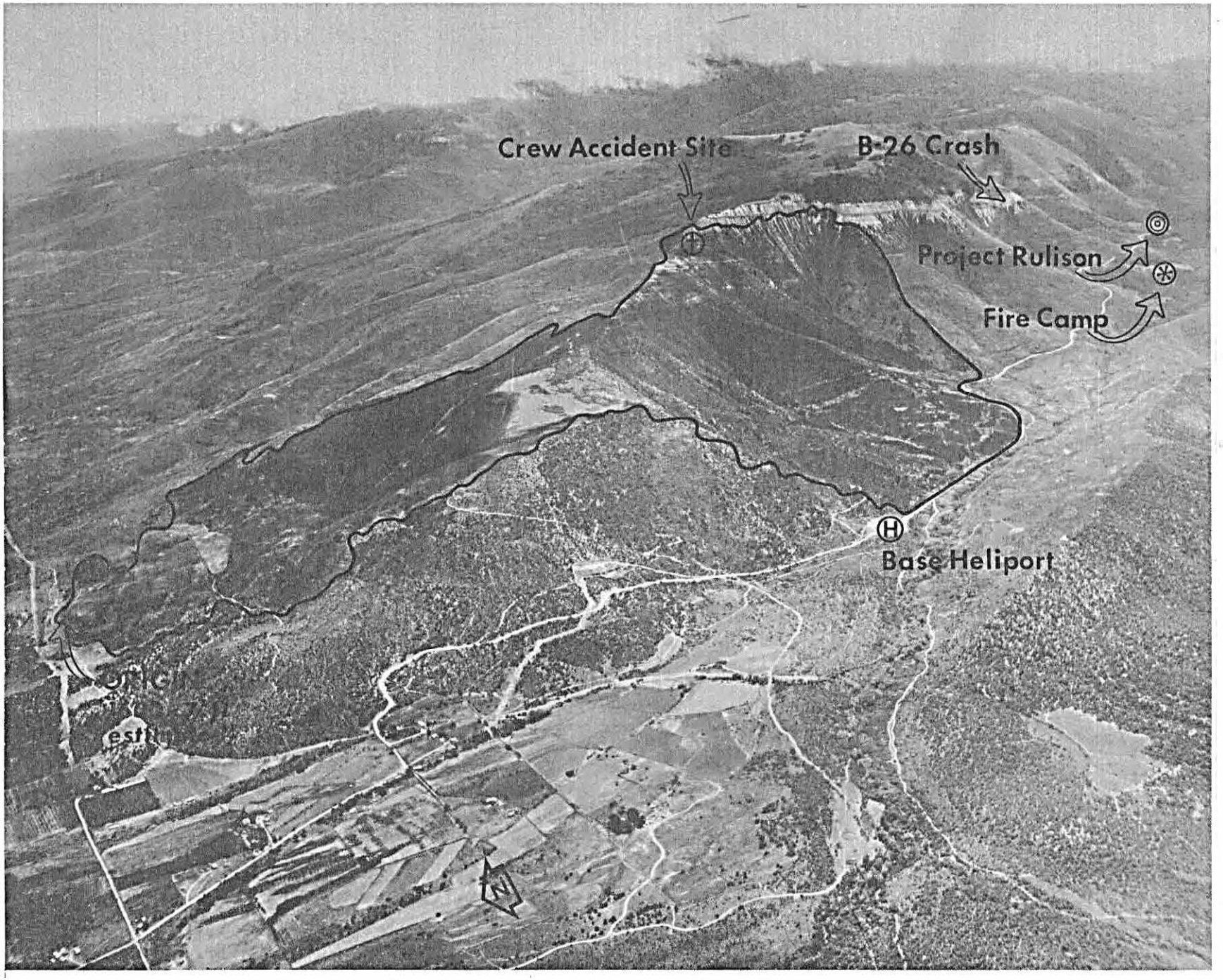


Figure 3b.--Oblique aerial photograph of Battlement Creek fire area, July 19, 1976.

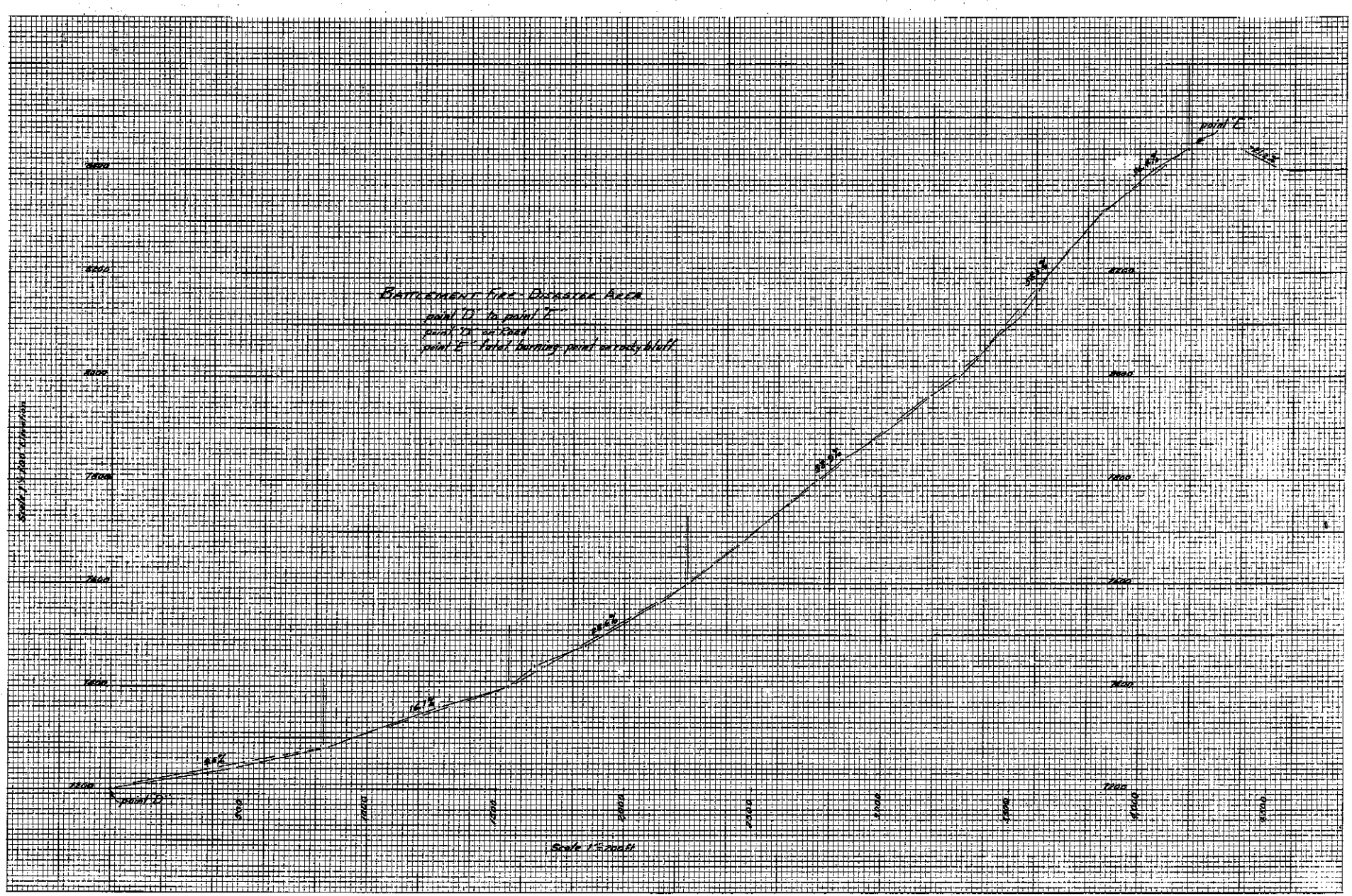


Figure 4.--Profile in saddle of main ridge above north draw.

3. Vegetation and Fuels

The vegetation of Battlement Creek reflects the arid climate. The dominant vegetation in the fire area is Gambel's oak-mountain mahogany. But vegetational types in the drainage vary according to elevation and exposure. On north-facing slopes, the vegetation begins at the stream bottoms with a mixture of pinon-juniper and sagebrush. As the elevation increases, the sagebrush decreases, and a mixed mountain shrub type gradually replaces pinon-juniper. Grass and sagebrush types are common on the ridges and drainage bottoms (cured cheatgrass was present in openings at lower elevations). Aspen and spruce-fir may be found at lower elevations along draws and moist areas. Some aspen occurred in the fire area at the head of the south draw; and prostrate Douglas-fir was found along the high ridge east of the south draw.

The mixed mountain shrub type was the primary plant community contributing to fire spread on Saturday, July 17. The dominant species in this community are Gambel's oak, mountain mahogany, serviceberry, and snowberry. The shrub community was dense and all but impenetrable in many places. The shrubs contained a large amount of fine dead branches throughout the canopy (fig. 5). Gambel's oak ranged as high as 10-12 feet or higher; it was 4-6 feet high along

Figure 5.--Serviceberry, mountain mahogany, and Gambel's oak in the Battlement Creek fire contained a large amount of fine, dead branches throughout the canopy.

the ridgeline above the chute (north draw). This ridgeline, the site of the accident, also contained several small openings and game trails (fig. 6).

A very significant weather event occurred 1 month prior to the fire which adversely affected the fuel complex. An extensive frost on June 14 killed more than 50 percent of the leaves on the Gambel's oak (other shrub species did not appear to be materially affected). Many of the dead leaves were still retained on the plants at the time of the fire (fig. 7). Shedding oak leaves contributed to a 1-2-inch litter layer beneath the mixed mountain shrub type. Pinon pine and juniper trees were scattered through the oak-mahogany type, primarily along the ridge north of the north draw.

Fuel moisture samples were collected at 1830 on July 20 at 8,800 feet on the ridge above the fire area:

Sample	Average moisture content (%)
Dead oak leaves (shrub canopy)	11.4
Leaf litter on ground	13.7
Dead oak branches (1/4-inch)	12.4
Green oak leaves	166.5
Living oak stems (1/4-inch)	193.8

The dead oak leaves in the shrub canopy and other fine fuels could have been at 7-8 percent moisture content, or less, at the time of the fire run on Saturday, July 17.

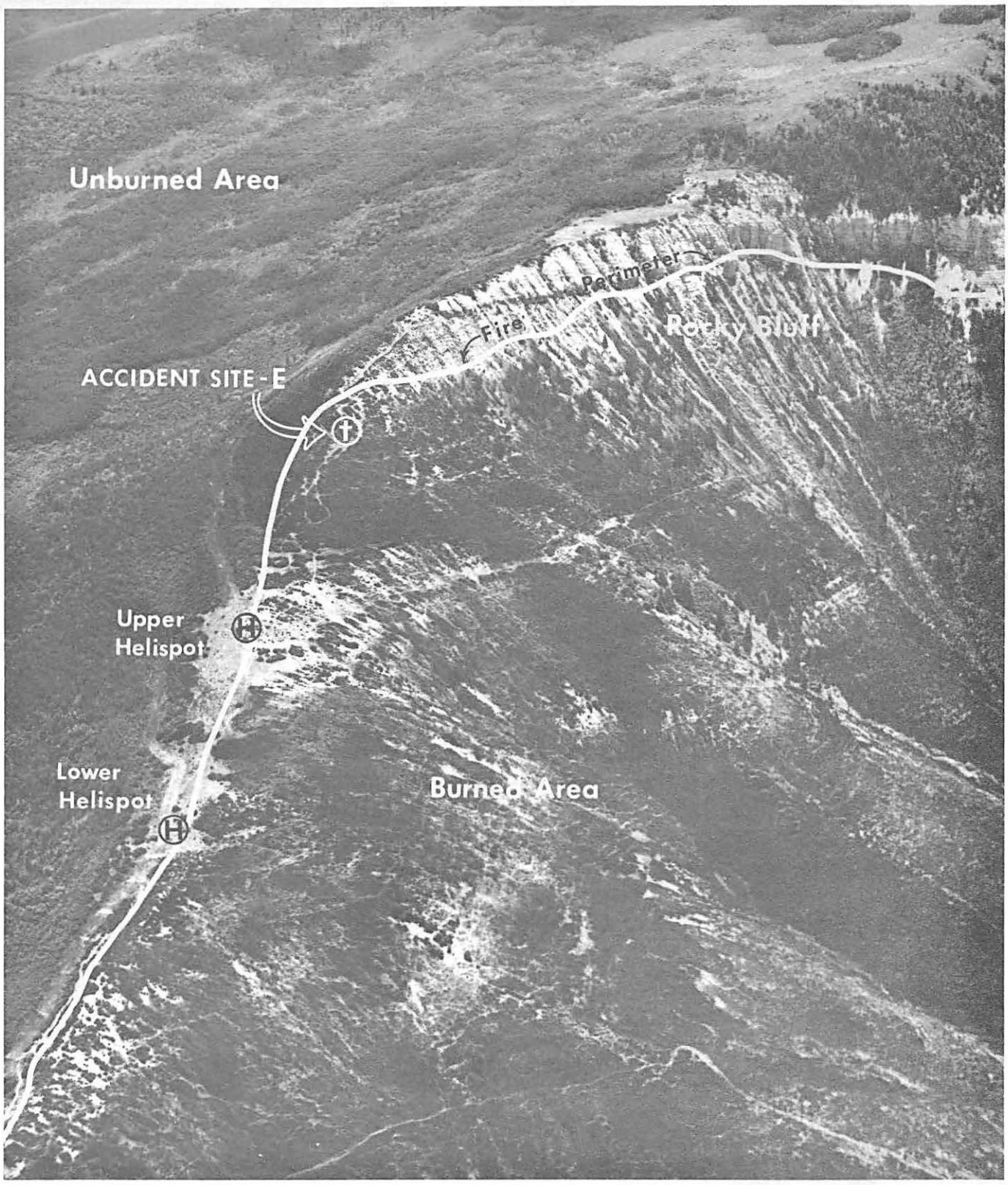


Figure 6.--The ridgeline where the fatalities occurred was characterized by 4- to 6-foot brush, small openings, and game trails. Oblique aerial photograph, July 19, 1976.

Figure 7.--Many of the frost-killed Gambel's oak leaves were still retained in the shrub crowns at the time of the fire.

The June frost significantly increased the amount of available fuel in the Battlement Creek area by contributing to the dieback of the oak leaves. One individual remarked that fire behavior conditions seemed 2-3 weeks early for this time of year.

Chemical analyses of the Gambel's oak leaves were conducted at the Northern Forest Fire Laboratory in Missoula:

	Green leaves	Dead leaves in crown
Crude fat (%)[1/]	1.60	.52
Total ash (%)	3.18	2.50
Low heat of combustion (B.t.u./lb.)[1/]	7886	7782

Thus, the crude fat content, or amount of volatile waxes, oils, and resins, was quite low. Much lower than the 8-12 percent reported for southern California chaparral.

D. Origin and Initial Suppression Effort

The action leading up to the time of BLM's initial attack on July 15, began 4 days earlier, July 12, on private land.

Sunday, July 11, a severe lightning storm struck the Morrisania area late in the afternoon. Much of the lightning activity occurred in the vicinity of the Eames Orchard. This lightning activity was followed by what was described as a

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1/ Samples were not frozen. Escape of volatiles might tend to make these values low.

moderately heavy shower. Records indicated .06 rain fell in the town of Grand Junction, Colorado, approximately 40 miles southwest of the mesa lying in the Colorado River valley. No fire was reported at that time.

On July 12, at approximately 1330, a fire was reported in SE¼, NW¼, Section 11, T7S, R95W, at Eames Orchard (fig. 8). This fire was controlled by 1700 at 1/2 acre by the Grand Valley Volunteer Fire Department. BLM air patrol (783) confirmed the fire was no longer smoking at 1925.

At 2130, a lightning strike was observed by a local citizen in approximately the same vicinity which resulted in an immediate fire start. The Grand Valley Volunteer Fire Department responded to this fire with five men and a ground tanker. They contained the fire and returned home at 0300, July 13.

During the daylight hours of Tuesday and Wednesday, July 13-14, a smoke surveillance was maintained of the area by the captain of the Grand Valley Fire Department from his place of employment and by other members of the department at varying times.

On Thursday, July 15, at approximately 1400, smoke was again noted in the area by the residents of the Eames Orchard, and a call was placed to the Grand Valley Fire Department. Two men from the Grand Valley Department responded, arriving at the fire approximately 1430. They found the fire was again in the same location they had taken action on twice the

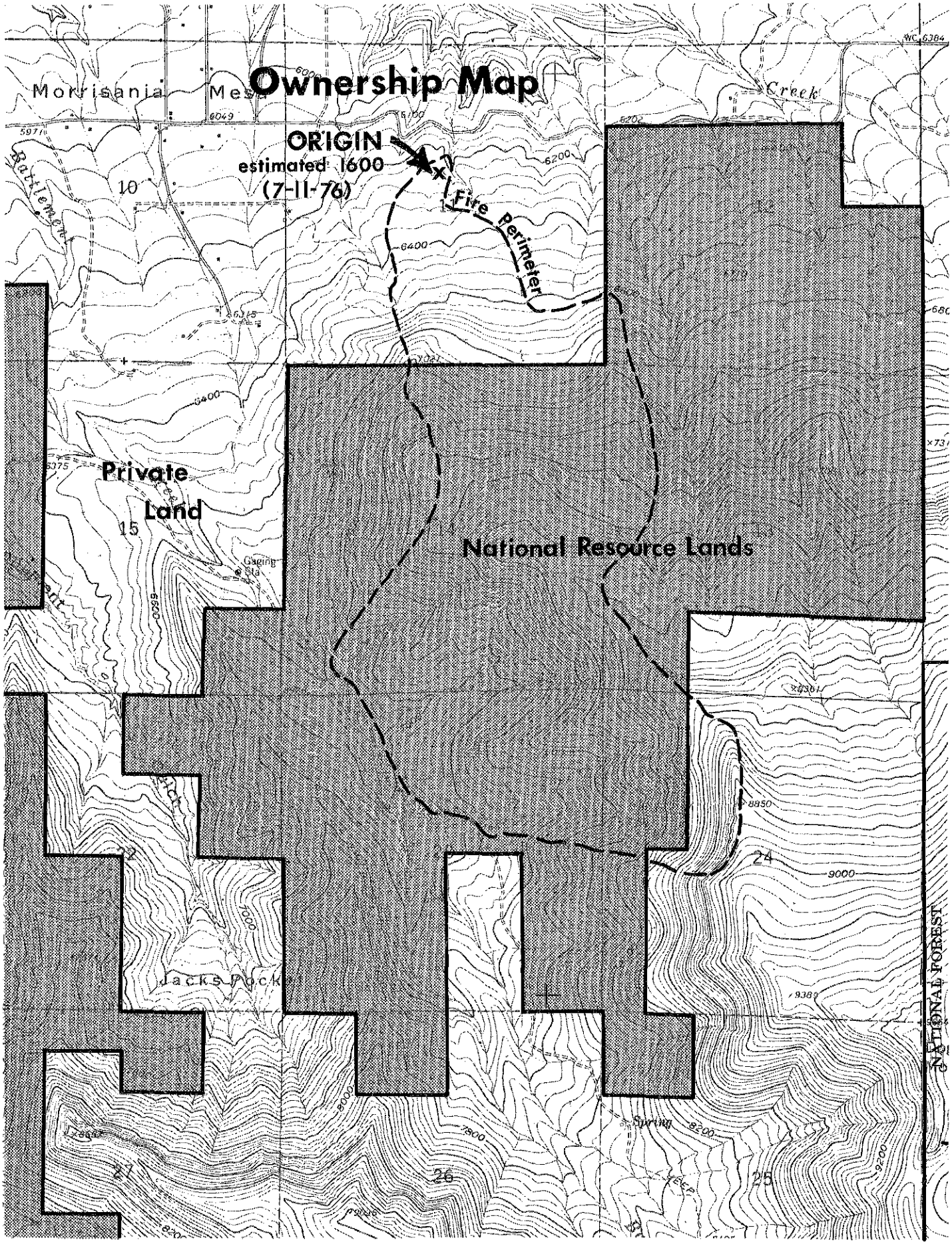
Ownership Map
ORIGIN
estimated 1600
(7-11-76)
Fire Perimeter
Private Land
National Resource Lands
Morrisania Mesa
Creek
Rattlesnake
Gaging Sta
Jacks Pocket
Spring
10
15
22
24
25
26
27
NATIONAL FOREST

Figure 8. -20-

previous Monday. The two men were just starting suppression action when an increase in wind velocity was noted. The fire jumped about 20-30 feet to the south and southeast into sage and cheatgrass fuels and spread rapidly. The pumper was considered to be in danger and the men moved the vehicle and radioed for assistance. The fire was gaining momentum and velocity; the men decided to remain on the west side of the fire and wet down that area with the water they had. The wind velocity kept increasing at this time.

At approximately 1430, the Grand Valley Fire Chief went to the north of the area on a higher mesa some 5 miles distant and had the area in observation. He reported observing a pattern of fire about 50 yards wide moving rapidly southeast.

The Grand Valley Fire Captain reported observing a cloud of fire and smoke erupt from the area at a time of 1500. His location was about 6 miles northeast of the fire.

Additional manpower and equipment were dispatched to the scene by the Grand Valley Fire Department (time undetermined).

At 1510, July 15, Wayne Fisher, BLM, radioed Grand Junction Fire Dispatch a location on the fire from his visual observations from some distance away.

Grand Junction District Fire Management Officer Roy Johnson initiated BLM action at 1522 while on an aerial observation flight. The initial order was for a retardant drop

and two helitack crews. An additional retardant drop was ordered almost immediately. At approximately 1600, the Fire Boss Jack Haslem, a local district employee, was alerted and two 20-man crews were ordered.

At 1548, BLM air tanker No. 59 was dispatched with an ETA of 15 minutes and the county fire department had been advised to clear a drop zone.

The Grand Valley crew on the fire reported the first retardant drop at 1600. They had pulled back to the Eames Orchard prior to arrival of the air tanker.

Several local pumper, volunteer, BLM and Forest Service crews containued to work along parts of the fire the night of July 15. Three air tankers, two 1,000-gallon B-26's and a 2,000-gallon C-119 worked hot spots until dark. The pumper-crews patrolled the west side from midnight to 0600 July 16 to prevent the fire from crossing the road to the west.

From the beginning of suppression effort on July 15, the attack strategy was designed to prevent western and southern spread of the fire. The presence of natural gas lines and wells to the west and Project Rulison to the south influenced this decision. Later, on July 16, the fatal crash of an air tanker near the fire was also an unusual event.

Project Rulison - This program was sponsored by Austrol Oil of Houston, Texas, and Los Alamos Scientific Laboratories

under the supervision of the Atomic Energy Commission. It was conducted to stimulate the natural gas pockets and facilitate gas collection by underground nuclear explosions.

Remaining at the project site are two above-ground metal holding tanks which contain some explosive vapors. Also contained in the tanks is a small amount of material which presents a low-level radiation problem. The well is closed with plugs at the bottom and also the top of the shaft. The valves have been closed and chain locked.

Plans are to close the site in the near future by removing the tanks and cementing the shaft closed.

Aircraft Accident - On Friday, July 16, 1 day before the crew accident, a B-26 air tanker crashed on a retardant dropping mission on the Battlement Creek fire. The accident occurred at 0856, approximately 1 mile south of the fire. The pilot was killed.

The crash diverted the line boss and the Sawtooth interregional crew for much of the day in controlling a fire at the crash site and removing the pilot's remains.

Although this accident is not related directly to the crew fatalities and injuries, it could be an indirect factor affecting overhead attitude and response.

Although the line boss and one crew were diverted to the crash site July 16, there were, however, no direct actions taken on the Battlement Creek fire as a result of this aircraft accident.

II. FIRE BEHAVIOR AND BURNING SEQUENCE ON JULY 16 AND 17, 1976

A. General Situation

The large scale synoptic weather pattern over western Colorado and the Battlement Creek fire area on Saturday, July 17, was one of high pressure aloft and a very flat surface pressure pattern associated with a poorly defined thermal low. A large scale pattern of this type is conducive to generally light wind flow where local effects dominate the weather picture.

A low pressure area aloft situated off the central California cost Saturday morning, July 17, (fig. 9) had weakened and moved northeastward by Sunday morning, July 18, (fig. 10) to the northern Nevada-California border. This increased free air flow above 12,000 feet from a range of 2-15 m.p.h. at Grand Junction Saturday at 0600 to 13-25 m.p.h. by 1800 (fig. 11). Below 12,000 feet, winds decreased from the 5-16 m.p.h. range to 1-8 m.p.h. during the same time period. Grand Junction is about 40 air miles SW of the fire site, and winds aloft above approximately 8,000-9,000 feet can be expected to be representative of the fire area. This relatively weak upper air flow permitted local terrain effects to dominate the wind field in the fire area. The fire burned over an elevation range of 6,200-8,400 feet m.s.l. on a steep, west-facing slope. The accident occurred at approximately 8,200 feet m.s.l. Terrain effects produced upslope afternoon winds 10-15 m.p.h., with

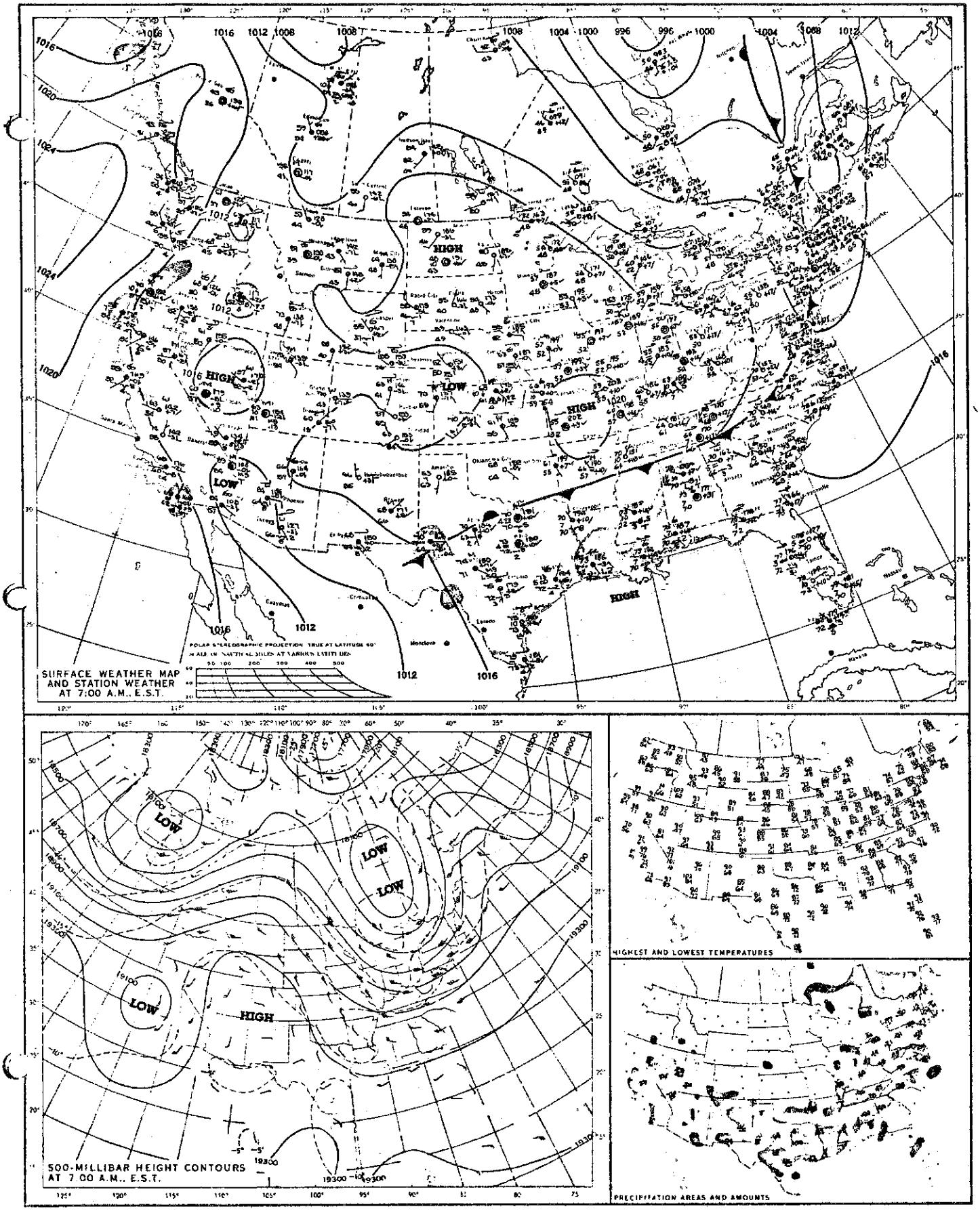
SURFACE WEATHER MAP
AND STATION WEATHER
AT 7:00 A.M., E.S.T.
500-MILLIBAR HEIGHT CONTOURS
AT 7:00 A.M., E.S.T.
HIGHEST AND LOWEST TEMPERATURES
PRECIPITATION AREAS AND AMOUNTS

Figure 9.

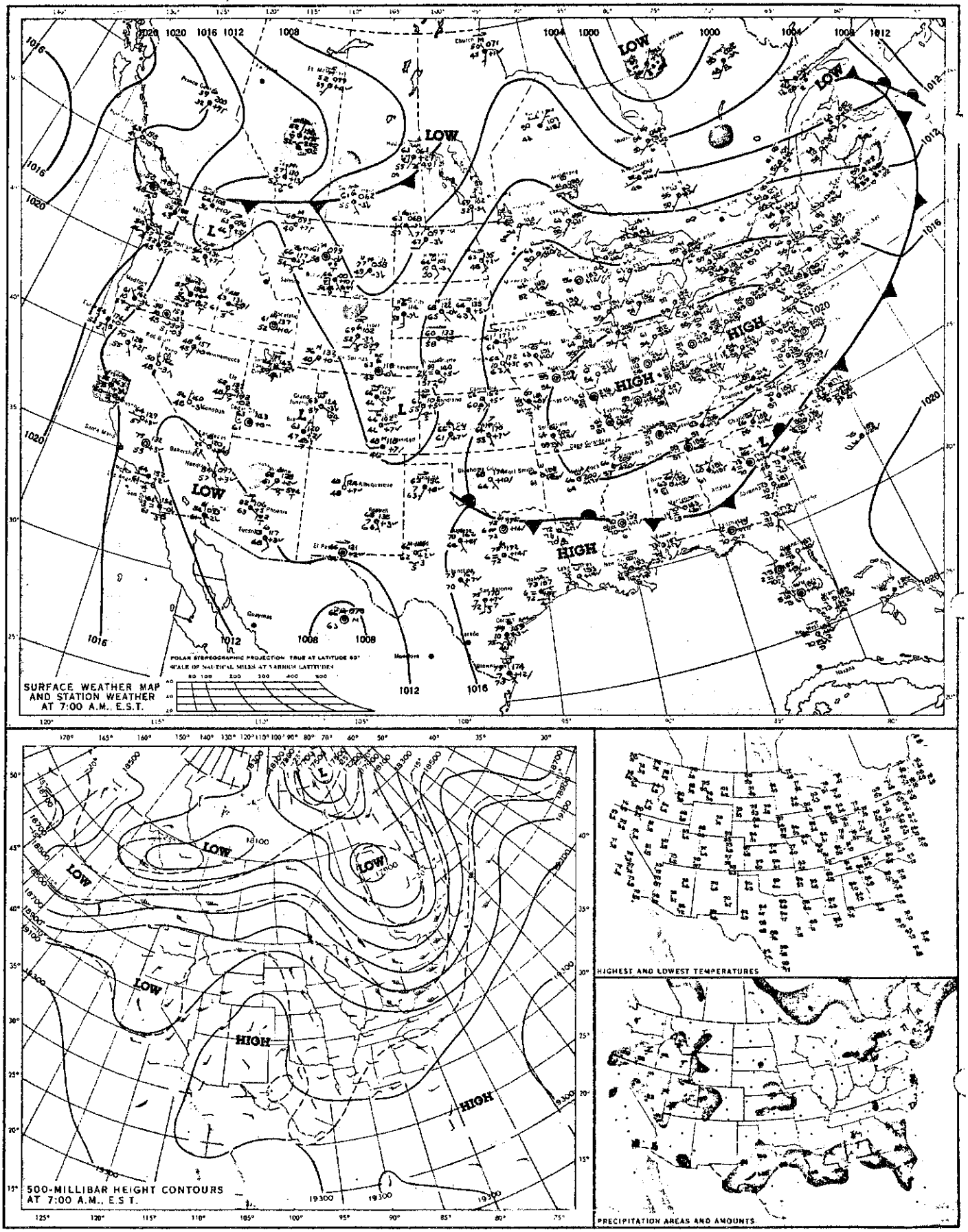
SURFACE WEATHER MAP
AND STATION WEATHER
AT 7:00 A.M. E.S.T.
POLAR STEREOGRAPHIC PROJECTION TRUE AT LATITUDE 60°
SCALE OF NAUTICAL MILES AT VARIOUS LATITUDES
500-MILLIBAR HEIGHT CONTOURS
AT 7:00 A.M., E.S.T.
HIGHEST AND LOWEST TEMPERATURES
PRECIPITATION AREAS AND AMOUNTS
LOW
HIGH

Figure 10.

July 17, 1976, 0600 m.d.t.			July 17, 1976, 1800 m.d.t.		
Height Feet	Direction	Velocity Knots[1/]	Height Feet	Direction	Velocity Knots[1/]
5698	153	05	5791	292	07
6623	227	04	6715	282	05
7548	232	07	7639	259	02
8473	238	10	8552	128	02
9385	254	13	9365	127	01
10297	260	14	10177	213	02
11232	265	14	11028	204	06
12173	276	11	11896	203	11
13114	271	07	12764	207	15
14055	203	05	13632	202	17
14998	165	08	14542	196	16
15943	149	09	15477	188	13
16888	137	09	16533	179	13
17912	113	08	17636	176	14
18868	081	08	18730	176	15
19822	087	05	19797	174	14
20903	119	02	20955	169	13
24779	230	13	25438	220	15
29862	294	09	30219	242	22
30938	290	13	34651	256	33
35889	276	33	40727	274	40
40057	288	37			

[1/] To convert knots to m.p.h., multiply knots x 1.15.

Figure 11.--Upper wind measurements at Grand Junction, Colorado.

higher gusts. These velocity values are based on measured upper winds at Grand Junction and on untrained observer estimates. No on-site fire weather measurements were made prior to the accident. Intense burning increased these wind values for a short period of time and account for higher estimates by observers. Surface winds recorded at Grand Junction and Rifle on July 16 and 17 are illustrated in the table below.

B. Prior Weather

The climate of the fire area is classified as arid. Mean annual and May-September precipitation are illustrated below for several locations in northwestern Colorado.

	Aspen	Craig	Grand Junction	Rifle	Gunnison	Glenwood Springs
Mean annual (inches)	18.67	13.42	8.41	10.93	11.0	18.03
May-Sept.	7.09	6.04	4.32	4.58	5.36	6.99

The values for the fire area itself are estimated to be 16-20 inches mean annual and 8-9 inches May through September based on NOAA isohyetal precipitation analysis maps (1931-60).

Precipitation records for 1976 indicate Grand Junction was somewhat below normal while Rifle was somewhat above. The fire area lies between these two stations but much higher and closer to Rifle. Precipitation on the fire site was most likely

very near normal. Monthly distribution of precipitation for 1976 at stations in the vicinity of the fire is illustrated below:

	Grand Junction		Rifle		Grand Valley
	Pcpn	Departure	Pcpn	Departure	Pcpn
Jan.	.13	-.51	.52	-.40	.26
Feb.	.81	+.20	1.81	+1.05	1.56
Mar.	.75	±0	M	M	1.53
April	.38	-.41	.89	-.04	-
May	1.49	+.86	-	-	-
June	.14	-.41	-	-	-
July-17th	.14	-.18	-	-	-
Season to date	3.84	-.45	-	-	-

Mean maximum temperatures for warm months in northwestern Colorado are illustrated below:

	Aspen 7913 ft	Craig 6280 ft	Grand Jct. 4843 ft	Rifle 5319 ft	Gunnison 7694 ft	Glenwood Spgs. 5823 ft
May	63.8	68.2	86.0	75.0	67.2	73.2
June	73.7	77.7	98.0	84.5	77.5	83.3
July	79.8	85.9	99.0	91.2	83.5	90.0
Aug.	77.8	83.4	98.0	88.5	80.5	87.0
Sept.	71.6	75.4	93.0	81.2	75.2	80.4

July is the month with the highest average maximum temperature. These July normals can be seen to be similar to observed maximum temperatures before and on the day of the fire accident as illustrated below:

		Grand Junction	Rifle	Glenwood Springs	Gunnison
July 14	Max.	98	91	92	84
	Min.	--	--	--	--
July 15	Max.	97	91	93	83
	Min.	60	49	51	42 (.01)
July 16	Max.	99	92	M	86
	Min.	65	48	M	44 (.04)
July 17	Max.	97	95	M	--
	Min.	70	52	M	46

Note that Gunnison received light precipitation (.01 and .04 inch) on July 15 and 16.

Weather was described on the fire Saturday, July 17, as being fair and hot. This is reasonable in view of the observed temperatures at Grand Junction and Rifle reaching into the mid and upper 90's.

The freeze of June 14 mentioned earlier was widespread over western Colorado. The minimums observed were:

	°F.	Elevation
Grand Junction	34	4843 ft
Rifle	32	5319 ft
Eagle	32	6600 ft
Gunnison	23	7694 ft
Montrose	36	5794 ft
Steamboat Springs	27	6695 ft

With the fire elevation well above most of these stations, it is reasonable and conservative to estimate minimum temperatures in the 23-27°F. range. Palmer drought values for western Colorado are in the normal range indicating little stress on vegetation. The occurrence of the freeze, therefore, becomes more important from the point of view of altering normal vegetative condition.

Since no direct on-site weather observations were available from the fire, the next best choice was to go to nearby stations. Rifle and Grand Junction weather is illustrated below:

July 16, 1976

	Grand Junction				Rifle			
M.d.t.	CldCovr	Temp	DP	Wind	CldCovr	Temp	DP	Wind
0545	Clr	68	27	NE/12	Clr	51	38	NE/4
0845	1/10	78	37	ESE/11	3/10	66	46	Calm
1145	2/10	93	43	SE/6	3/10	81	49	Calm
1445	3/10	95	45	W/10	4/10	91	55	N/6
1745	3/10	96	31	WSW/7	3/10	81	60	Calm
2045	7/10	89	36	ESE/4	2/10	71	56	N/7
2345		--				--		

July 17, 1976

	Grand Junction				Rifle			
M.d.t.	CldCovr	Temp	DP	Wind	CldCovr	Temp	DP	Wind
0545	1/10	70	42	E/7	Missing			
0845	4/10	75	45	ESE/6	4/10	65	52	N/3
1145	2/10	88	45	ESE/3	2/10	84	42	S/5
1445	4/10	94	47	W/8 Cb ALQDS K ALG MTS	4/10	93	55	NE/4 Cb SE
1745	9/10	91	45	W/7 K and RWU T HVY cu	10/10	84	50	N/7 Virga ALQDS
2045	10/10	71	56	SE/5	10/10	74	52	SE/8 Cb ALQDS T SW
2345	10/10	64	59	WSW/9	10/10	69	43	NW/4

There was some question on July 17 between 1400 and 1500 m.d.t. of the possibility of a thunderstorm near the fire. The remarks from Rifle at 1445 indicate a cumulonimbus cloud to the southeast. This point was very carefully checked with National Weather Service radar observations at the same time. Echoes were replotted and the closest echo to the fire as reported by the Rock Springs radar was about 8 miles north-northeast of Rifle at 1435 MDT on July 17, 1976. Allowing for extremes in errors in observation and plotting, it would be very difficult to place a significant thunderstorm west of Rifle and near the fire at that time. Based on these observations and

most observers on the fire, a thunderstorm downdraft has been ruled out as a possible contributing factor. Forecasts issued from Denver for Saturday, July 17, are illustrated verbatim below. They called for showers and thunderstorms in western Colorado which did, in fact, occur.

COLORADO ZONES
C001
C005
C010
ISSUED 4AM MDT SAT 7/17/76
FAIR TO PARTLY CLOUDY WITH WIDELY SCATTERED AFTERNOON AND EVENING SHOWERS OR THUNDERSTORMS TODAY. MOSTLY CLOUDY AND LITTLE COOLER SUNDAY WITH SHOWERS OR THUNDERSTORMS SCATTERED. HIGH TODAY 85 TO 95. LOW TONIGHT 50 TO 65. HIGH SUNDAY 80 TO 90. WIND VARIABLE 5 TO 15 MPH EXCEPT GUSTY NEAR THUNDERSHOWERS. PROBABILITY OF PRECIP 20 PERCENT TODAY 30 PERCENT TONIGHT 40 PERCENT SUNDAY.$$

ZCZC
DEN FP1 171010
FPUS1 KDEN 171010
ISSUED 4AM SATURDAY

COLORADO
FAIR TO PARTLY CLOUDY AND CONTINUED WARM OVER STATE TODAY WITH WIDELY SCATTERED AFTERNOON AND EVENING THUNDERSTORMS..SOME HEAVY IN EAST PORTION TODAY. SHOWERS AND THUNDERSHOWERS INCREASING OVER MOUNTAINS AND WEST SUNDAY WITH WIDELY SCATTERED THUNDERSTORMS EAST. A LITTLE COOLER MOUNTAINS..WEST..AND NORTHEAST SUNDAY. HIGH TODAY UPPER 80S TO UPPER 90S EAST..85 TO 95 WEST WITH 75 TO 85 MOUNTAINS. LOW TONIGHT IN LOWER 60S EAST..50 TO 65 WEST WITH 40S AND UPPER 30S MOUNTAINS. HIGHS SUNDAY AROUND 90 EAST..80 TO 90 WEST..WITH MOSTLY 70S MOUNTAINS.

EAKIN..WSFO DENVER

COLORADO FIRE WEATHER MORNING MAP DISCUSSION
NATIONAL WEATHER SERVICE DENVER CO
845 AM MDT SAT JUL 17 1976

HIGH PRESSURE RIDGE ALOFT STILL DOMINATES REGION..HOWEVER A CUT OFF LOW IS DRIFTING EASTWARD OFF THE CENTRAL CALIFORNIA COAST. ABUNDANT MOISTURE IS SPREAD THROUGHOUT THE WESTERN U.S. AND WILL SLOWLY BE MOVING INTO COLORADO OVER THE WEEKEND.

SHOWERS AND THUNDERSTORMS WIDELY SCATTERED IN WESTERN HALF OF STATE TODAY..MORE NUMEROUS SOUTHERN MOUNTAINS. ONLY ISOLATED ACTIVITY LIKELY ALONG EAST SLOPES. TEMPERATURES A LITTLE COOLER WEST TODAY OTHERWISE LITTLE CHANGE. NO SIGNIFICANT WINDS EXCEPT GUSTY NEAR THUNDERSTORMS.

OUTLOOK FOR SUNDAY...INCREASING SHOWER AND THUNDERSTORM ACTIVITY OVER MOUNTAINS AND WEST AND COOLER.

SMOKE DISPERSLA GOOD TO VERY GOOD.

LARISON....WSFO DENVER

ZCZC
DEN FP1 171620 AMD
FPUS1 KDEN 171620 AMD
ISSUED 10 AM SATURDAY

COLORADO UPDATED FORECAST
WIDELY SCATTERED SHOWERS AND THUNDERSTORMS MOUNTAINS AND WEST TODAY INCREASING SUNDAY. CLEAR TO PARTLY CLOUDY THROUGH SUNDAY EAST WITH ISOLATED AFTERNOON AND EVENING SHOWERS AND THUNDER-STORMS. SLIGHT COOLING TREND WEST THROUGH SUNDAY. HIGH TODAY AND SUNDAY 80S AND LOW 90S WEST UPPER 80S AND 90S EAST WITH 60S AND 70S MOUNTAINS. LOW TONIGHT UPPER 50S AND 60S WITH 40S MOUNTAINS

A thunderstorm occured at Rifle in the evening of July 17 (2040 m.d.t.) and .04 inch of precipitation was recorded.

Ten-hour time lag fuel moisture was in the 3-5 percent range for several stations in the week preceding the accident (fig. 12).

10-Hour Time Lag Fuel Moisture (Percent)

	Colorado National Monument	Mesa Verde	Grand Junction	Gould	Eagle FAA	Artesia	Nucla
July 8, 1976	4	–	4	–	6	3	3
July 9, 1976	4	5	3	5	7	3	3
July 10, 1976	3	7	3	6	4	3	3
July 11, 1976	4	7	4	5	4	3	3
July 12, 1976	5	8	3	4	5	2	4
July 13, 1976	9	6	8	11	7	3	5
July 14, 1976	5	6	5	5	5	2	5
July 15, 1976	4	–	4	–	6	3	4
July 16, 1976	–	6	–	6	–	–	–
July 17, 1976	4	10	–	5	6	3	4
July 18, 1976	8	–	12	7	6	21	7
July 19, 1976	14	40	11	27	13	5	8

Figure 12.

Showers at isolated points temporarily increased fuel moisture to as much as 11 percent. Generally, however, fuels dried rapidly back to the 3-5 percent range.

C. Fire Behavior Appraisal

A rather typical weather pattern, steep mountainous terrain, and frost-induced dieback in Gambel's oak established conditions for high rates of fire spread in the Battlement Creek drainage during afternoon hours. For these reasons there might be a tendency to equate the Battlement Creek fire with a southern California brush fire, but such was not quite the case. Precipitation amounts were near normal for this time of year, humidities were not unusually low, and wind velocities generally fell far short of Santa Ana conditions. Green fuel moistures for oak leaves and stems were 166 percent and 194 percent, respectively, well above the 60 percent moisture contents recorded for drought-stressed chaparral in California. Nevertheless, dead oak leaves on the ground and in the crowns, abundant fine dead branches in the oak and mountain mahogany crowns, the dense arrangement of 6- to 12-foot shrubs, and slopes ranging from 50-75 percent provided all the potential necessary for a fast-spreading, high-intensity fire.

D. Fire Behavior July 16

The major fire behavior on the day before the tragedy apparently resulted from a hooking action down toward the road and a subsequent run uphill in oakbrush to the ridgeline. This side

drainage lies just north of the drainage that burned out on Saturday. The run on Friday burned out a major portion of the drainage (from the road east to the ridgetop) in about 30 minutes. Fire whirls were associated with this run which occurred between 1600 and 1700 (fig. 13).

Friday afternoon's fire behavior was impressive. On Saturday it was considered important to prevent the fire from crossing the road and catline and getting into the large drainage to the southwest. Also a key part of the line to hold on Saturday was the 1,800-foot stretch from the rocky bluff to the helispot.

On Friday a catline was constructed down the ridge of the next side drainage (A-C, fig. 14). This line was burned out during Friday afternoon; the burning out operation also proceeded along the road from the cattleguard (C, fig. 14) north to the bend in the road (D, fig. 14).

E. Burning Sequence July 17

There were very few smokes visible in the area north of the catline on Saturday morning--perhaps a few along the road and on the ridge above the bend in the road.

The plans for Saturday's day shift were to mopup along the catline (A-C) and main road (C-D) and burn out the unburned fuel (A-D). The Mormon Lake crew was to improve and burn out the line from the rocky bluff to the helispot (E-G) and move into the black area when unburned fuels were fired out from below.

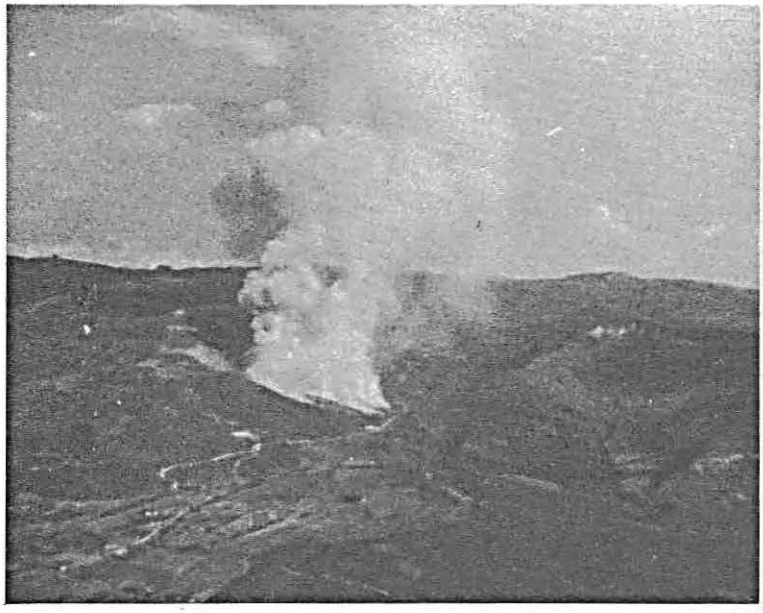

Figure 13.--The spectacular fire behavior on Friday afternoon, July 16, was highlighted by the activity of fire whirls.

INDIVIDUAL FIRE REPORT

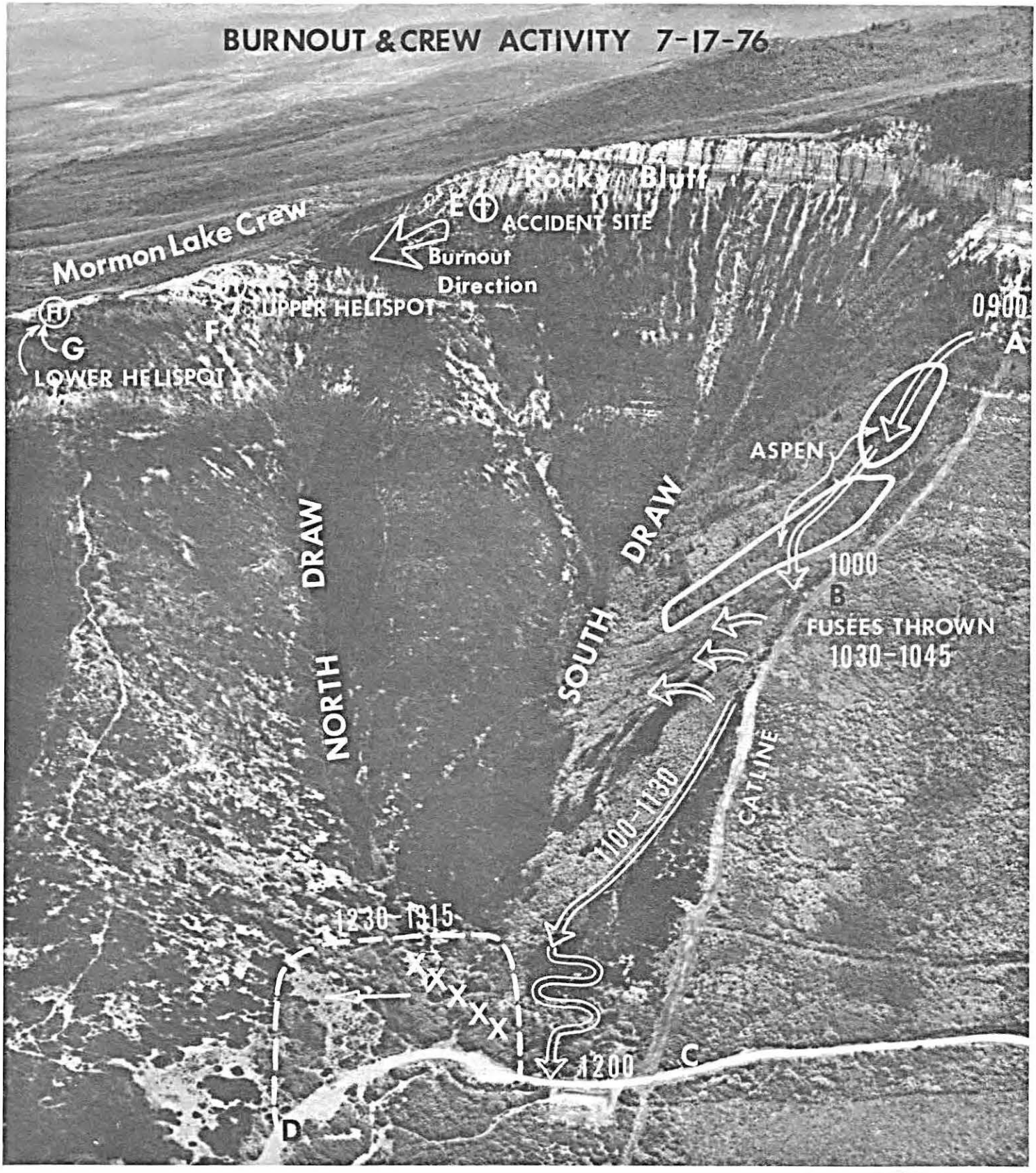

Fig. 14 . Burnout operation on Saturday, July 17, 1976, by Mormon Lake and Happy Jack crews. Happy Jack crew burned out from point "A" to point "C" between 0900 and 1200. They burned out inside the black of the previous day's burnout. The dashed area at the base of the north draw was burned out between 1230 and 1315. Meanwhile, the Mormon Lake crew was improving and burning out the line in the saddle above the north draw between 1100 and 1400+. (← = burnout path; X's = burnout crew; H = helispot).

It is important to account for the burning out operations on Saturday because these operations materially contributed to the fire behavior situation.

The Happy Jack crew started burning out from the rocky bluff at 0900. They proceeded downhill along the edge of the previous day's burnout north of the catline (arriving at the road, Point C, at 1200). The same crew burned out above the bend in the road between 1230 and 1315 (fig. 14). Meanwhile the Mormon Lake crew at the top of the draw was improving the line between the rocky bluff (Point E) and the helispot (Point G) and attempting to burn it out. Line improvement and burning out took place between 1100 and 1400 along the ridgeline. The burning out on top did not go well; the fuels did not sustain good fire spread.

Everyone in the Happy Jack burnout squad was back on the road at 1315. Their burnout fires began burning well about 1300 (fig. 15) and moved up the south draw first and then worked onto the ridge and into the north draw. A photograph taken from a Cessna 210 at about 1420 shows the fire on the spur ridge between the two draws and below the burned island (fig. 16). Thus, it took over an hour for the fire to burn half way up the slope. The fire then must have burned into the upper end of the steep north draw and burned rapidly to the helispot by 1430. A photograph taken about 1430 from the rocky bluff by Mormon Lake crew member John Meyers shows the fire burning towards the helispot

Figure 15.--The burnout fires above the road on Saturday, July 17, began to produce abundant smoke at 1300. This view looks north from fire camp.

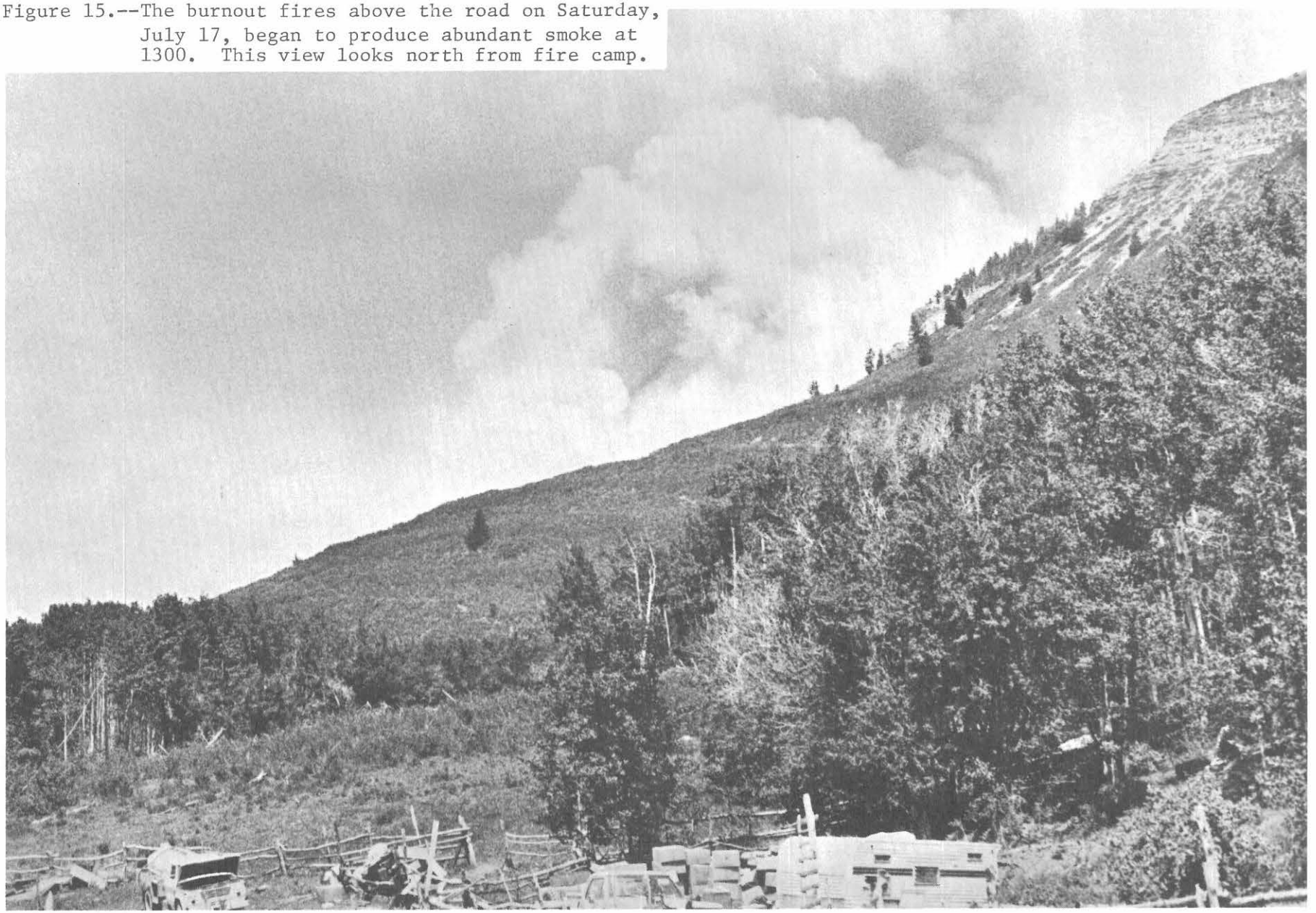

Figure 16.--This view of the convection column was photographed by an aerial observer at 1420 on Saturday during a Cessna 210 flight from Eagle to Grand Junction. The column is centered on the ridge between the north and south draws and positioned about half way between the road and the ridgeline where Mormon Lake crew was working.

before burning under the rocky bluff (fig. 17). The Bell 212 helicopter pilots observed a slightly delayed run around the unburned island and up the south draw, hooking around the point of the rocky bluff (fig. 18). The four members of the Mormon Lake crew were lying in the fireline near the point of the rocky bluff. The fire probably reached their position about 1435-1440 (fig. 19). Thus, the fire travelled about 3,600 feet (scaled horizontal distance--from the base of the north draw uphill and easterly to the ridgetop--C-D to F-G, fig. 14) in 1-1/2 hours.

Although generally light, upslope winds were observed earlier in the day, reports had winds increasing substantially between 1350 and 1445 (probably gusting to 20-30 m.p.h.). The winds induced by the main fire whipped up the burnout fires in the saddle between the rocky bluff and the helispot, further threatening the upslope escape route the four squad members followed. John Meyers reported flame heights 25-30 feet above the shrubs when the fire came through the saddle. Flames were at a low angle and elongated.

At 1445, the Bell 206-B helicopter pilot observed from a distance of about 20 miles a vertical convection column over the Battlement Creek fire with a "nuclear explosion" type cap on top. He estimated the convection column height at 16,000 feet m.s.l. (the same height as the tops of cumulus clouds in

Figure 17.--Mormon Lake crew member John Meyers photographed the fire running towards the lower helispot at about 1430 on Saturday, July 17. This photograph was taken from the rocky bluff looking north. This is the fire run that stopped the burnout squad from joining the line improvement squad in the safety zone beyond the flames.

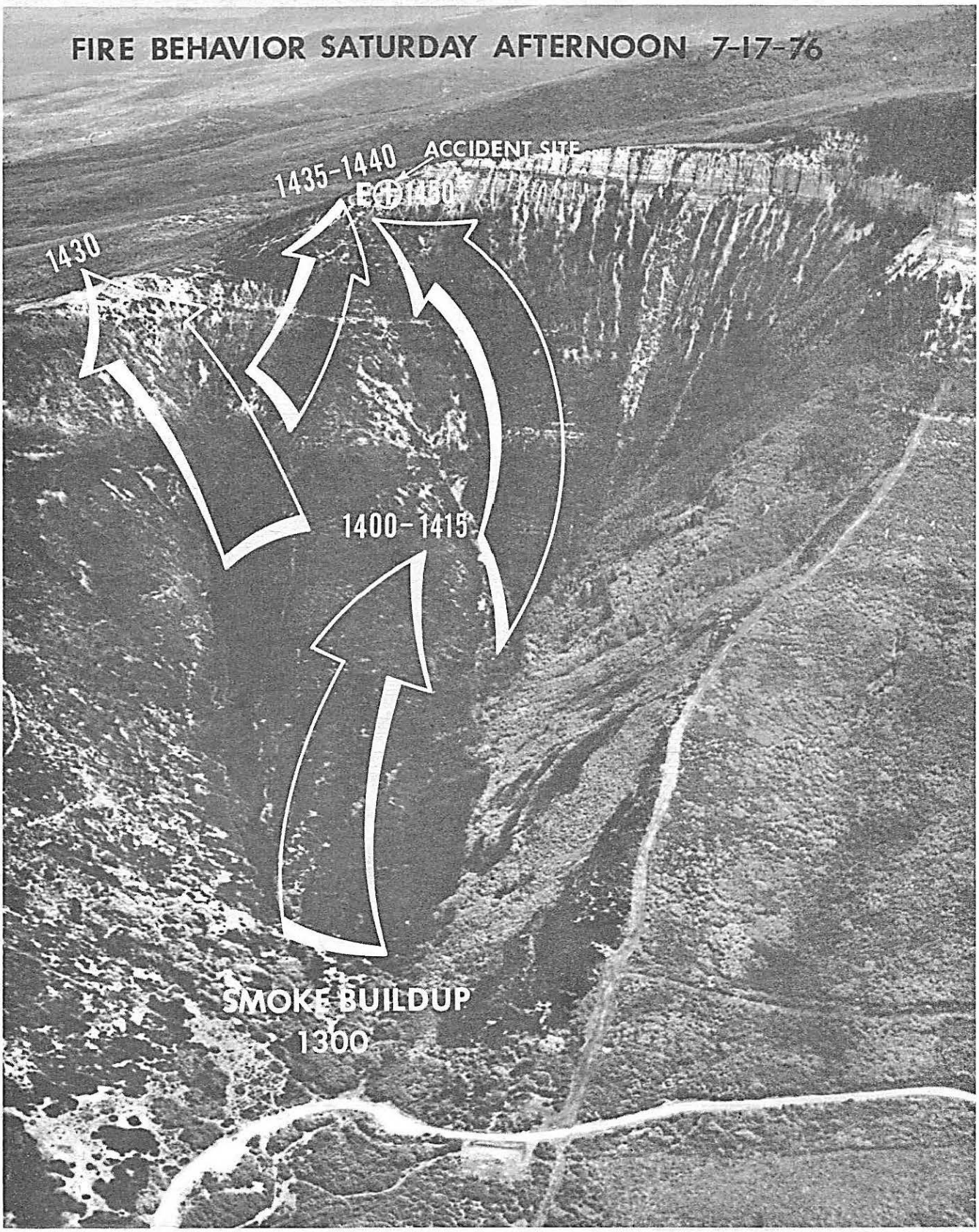

Fig.18-Fire run sequence on Saturday, July 17, 1976. Smoke began to build above road at 1300. The fire ran up the south draw first and was below the unburned island at 1400-1415. The next run was up the north draw, burning to the ridgeline in the saddle at about 1430. The fatal burning across the point of the rocky bluff (Point "E") occurred about 1435-1440.

Figure 19.--Helicopter crew searching for missing Mormon Lake crew members right after fire burned across Point E at the base of the rocky bluff. Crew boss Czak and crew members Furey, Nelson, and Gibson had been lying in the ridgetop fireline just to the right and below the helicopter. This picture probably taken about 1500 on July 17, 1976

the area). The convection column was visible from the airport at Grand Junction.

The fire burned across the saddle in a couple of places. But it was essentially contained on the ridgetop by the handline, natural openings, and earlier retardant drops.

F. Chaparral Model Nomograph

Site conditions on Saturday afternoon were run using the chaparral fuel model[2/] of the National Fire-Danger Rating System with nomographs designed to predict fire spread, intensity, and flame length. Two different windspeeds (15 and 25 m.p.h.) and three slope percents (40, 60, and 75) were used in calculations. Dead fuel moisture was set at 5.5 percent and live fuel moisture at 150 percent. Nomograph results:

Condition	1	2	3
Windspeed (m.p.h.)	15	15	25
Slope (percent)	40	60	75
Effective wind (m.p.h.)	17	18	29
Reaction intensity (B.t.u./min./ft.^{2})	12,000	12,000	12,000
Rate of spread (ch./hr.)	110	125	240
Flame length (ft.)	20-30	20-30	30-40
Fireline intensity (B.t.u./sec./ft.)	5,500	6,000	12,000
Time to go 1/2 mile (min.)	24	21	11
Time to go 3/4 mile (min.)	36	32	16.5

Conditions 1, 2, and 3 represent the lower slope, mid-slope, and the upper portion of steep chute, respectively. Condition 3 also is characterized by a 25 m.p.h. windspeed to reflect

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2/ Fire-Danger Rating System fuel model B was selected because it came closest to representing oakbrush conditions on the Battlement Creek fire.

probable peak gusts. Conditions 1, 2, and 3 show the fire traveling 1/2 mile in 11-26 minutes. In reconstructing actual fire spread from photographs and observations, it appears that the fire traveled the last 1,800 feet to the ridgeline in about 15 minutes or well within the range of modeled conditions. In terms of fireline intensity, 100 B.t.u./sec./ft. of fireline is about at the upper limit for control by hand crews and 500-700 B.t.u./sec./ft. for direct control of a fire by any forces. Fireline intensities for cases 1, 2, and 3 were 5,500, 6,000, and 12,000 B.t.u./sec./ft., respectively, or absolutely uncontrollable.

G. Fire Behavior Summary - Steep chutes, 10-20 m.p.h. upslope winds, and dense, flammable Gambel's oak all combined to place those in the saddle above in an extremely vulnerable position. The topography below the saddle, as mentioned earlier, probably denied the crew members good visibility of what was going on below them. Visibility also was impaired by dense smoke from the main fire and the squads burnout fires.

A prophetic report prepared by the Colorado State Forest Service[3/] described a "fuel type X" that supports high-to-severe wildfire hazards. These primarily oakbrush fuels "are dense, high brush 1-1/2 to 10 feet in height. Small scattered

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3/ Guidelines and Criteria for Wildfire Hazard Areas, September 1974, Colorado State Forest Service, Fort Collins, Colorado.

patches of conifer or deciduous trees or scattered individual trees may also exist but are of minor effect and occurrence. The fuels are continuous or nearly so. Despite heavy shading, the ground is seldom damp. Flammability may vary markedly in the year due to changes in fuel moisture and leaf fall. Fire seldom kills these species. Many re-sprout after fires with more stems resulting in more numerous, thin-stemmed fuels than before."

Burning characteristics are described as becoming "extra hazardous during special times of the year. The critical time of year varies with the species. For example, oakbrush is very difficult to burn when the leaves are green, *but when its leaves are brown and still hanging on the branches, it becomes one of Colorado's most flammable fuels* for 2 to 3 weeks in autumn." The key point here is that these highly flammable autumn conditions in oakbrush existed in the Battlement Creek drainage in *mid-July* due to the June 14 frost!

The report clearly described many of the events observed in the Battlement Creek fire:

> "The "X" fuels support medium to high intensity fires, short-range spot fires are common, rate of spread is moderate to fast, flare-ups brief but common and hot, just-burned area is tenable by humans within about 1/4 hour, the fire front is impassable. Brush fires seldom burn throughout the night and into the next day if suppression action is made.
>
> These areas are of state interest due to the associated burning characteristics, the difficulty of fire suppression and the resultant dangers to life and property during

special times. By their very nature "X" fuels often create a false sense of security due to their lush greenness and sometimes non-flammable periods. Many people find it impossible to believe the potential flammability until they witness burning in critical periods. Its (oakbrush) rate of fire spread has been observed and timed to be an incredible 16 acres per minute, steady for 3 hours, in Colorado! Fast running mule deer have been found dead in oakbrush burns--unable to outrun the fire's spread. Brush fires are very sensitive to wind direction. Property and lives considered safe on a flank can be quickly threatened within minutes by a wind shift."

Under the July conditions of frost-induced dieback in Gambel's oak in Battlement Creek, the oakbrush stands must be considered as a most potent fuel type.

III. SUPPRESSION EFFORT AND ACCIDENT SEQUENCE

A. Accident Sequence

In order to set the stage for full understanding of the events relating to the three burn fatalities and one serious burn injury of the afternoon of Saturday, July 17, 1976, it would be helpful to include the highlights of the previous day, Friday, July 16.

Stragety and Tactics--Day Shift, Friday, July 16 - The general plan for the day shift was to hold the fire to the east of the Battlement Creek road, and to stop the upcanyon southerly spread from reaching gas wells, pipelines, and the critical Project Rulison site, with its potential for gas explsions, radioactivity exposure, etc. To do this, the fire boss planned ground tankers and hand crews along the Battlement Creek road and generally northerly along the west flank toward the point

of origin (figs. 3a, 3b). Air tankers were used to retard spread along this flank. One of these air tankers, B-26 No. 56, flown by Don Goodman of Missoula, Montana, crashed and burned about 0856 m.d.t. Friday, July 16, killing pilot Goodman. Details of this accident are covered in a separate report. The line boss and Sawtooth interregional crew were involved much of the day on this crash and the resulting fire.

After early morning size-up by the fire boss and line boss, a bulldozer ordered earlier was assigned to build fireline generally along a spur ridgetop easterly from a cattleguard at point 7165 on the Battlement Creek road, near the center of Sec. 23 (fig. 3a). This line construction began about 0900 and was completed about 1600. The fire at this time (1600) was exhibiting vigorous behavior, including two impressive fire whirls, in the next draw about 1/2 mile north, near the section line 14/23.

The Coconino NF Mormon Lake and Happy Jack hotshot crews had arrived on the fire about 0630 Friday, and by early afternoon were in place ready to begin a major burnout of the newly constructed catline, starting at the base of rocky bluffs to the east, and burning westerly downhill along the catline toward the Battlement Creek road. Firing began at the top (Point A, fig. 20) about 1615, and reached the road at the bottom (Point C, fig. 20) about 2030 as darkness approached. This firing

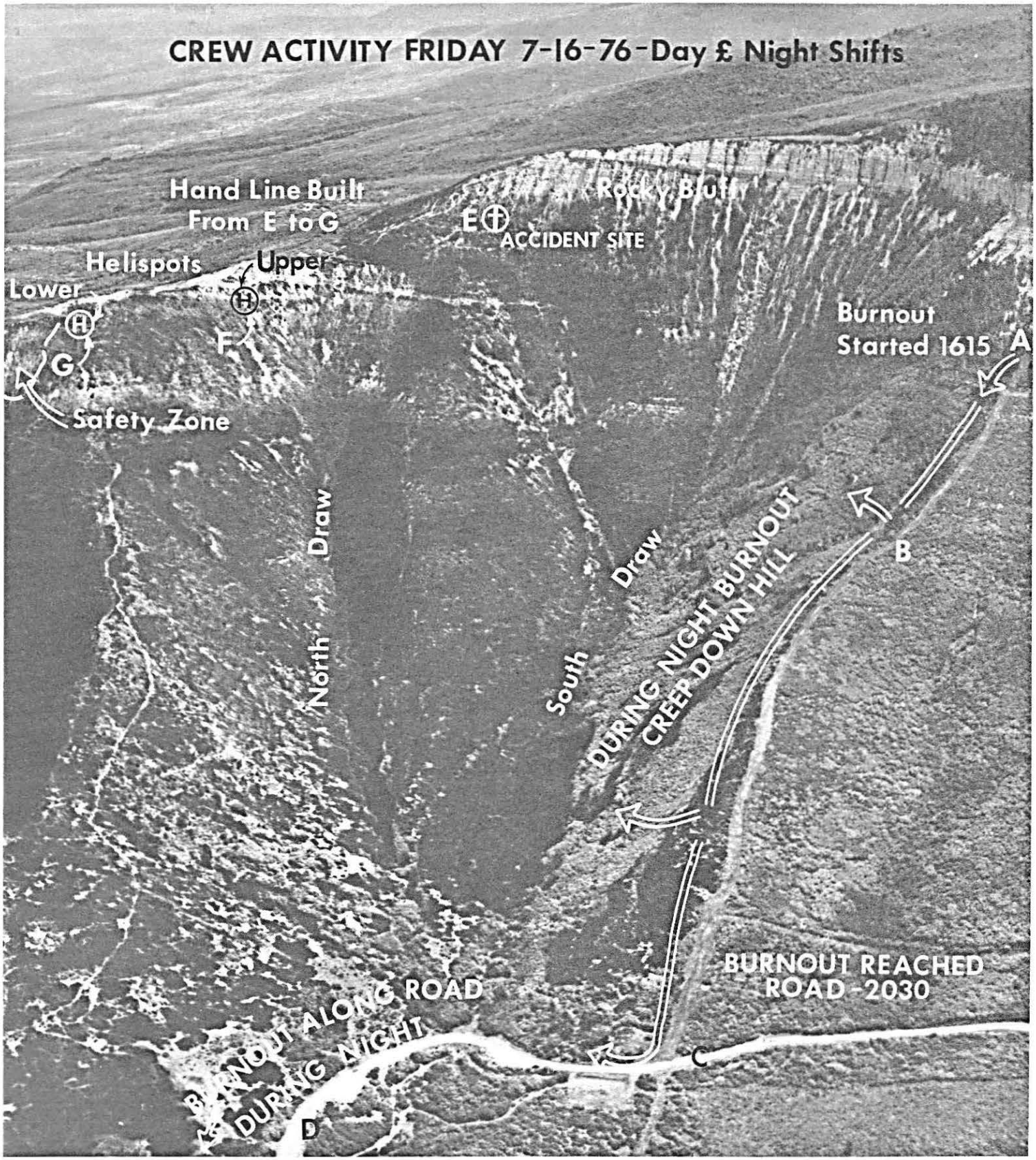

CREW ACTIVITY FRIDAY 7-16-76-Day & Night Shifts
Hand Line Built From E to G
Helispots
Upper
Lower
E
ACCIDENT SITE
Rocky Bluffs
F
G
Safety Zone
Burnout Started 1615
A
B
Draw
North
South
Draw
DURING NIGHT BURNOUT CREEP DOWN HILL
BURNOUT REACHED ROAD - 2030
BURNOUT ALONG ROAD DURING NIGHT
C
D

Figure 20.

was generally successful--a strip of 60 feet or more along the catline was burned, with a few locations exceeding 100 feet. No spotting occurred outside the line. This fire continued to creep downhill most of Friday night, burning mostly ground fuels. Some unburned patches of fuel remained between the catline and the draw just to the north.

Strategy and Tactics, Night Shift, Friday, July 16 - The night shift continued burning out from the bottom of this catline northerly along the east side of the Battlement Creek road (C-D and beyond along road, fig. 20) and by Saturday morning had tied into the burn of Friday afternoon near section line 14/23. This burnout by the night shift was spotty and had considerable unburned fuel remaining Saturday morning.

Also during the Friday night shift, other hand crews built handline along a ridgetop from near point 8850 in Sec. 24 (Point E, fig. 20). The intent here was to construct and burn out this ridgetop fireline Friday night. The line construction was completed, but burning out was not attempted because the crew had no fusees. Even if fusees had been available, night shift burning at this location would have been difficult and less than fully effective.

The Mormon Lake and Happy Jack crews were bedded down about 0100 for the night in fire camp and got 5-6 hours rest under fire camp conditions.

Strategy and Tactics, Day Shift, Saturday, July 17 - Following debriefing of night shift overhead and a morning look at the fire by the fire boss and the line boss, the strategy for Saturday day shift was to hold the south flank catline and the west flank Battlement Creek road. The handline (about 40 chains long) built along the ridge in the southeast corner during the night from E to G (fig. 21) was to be widened and burned out, thus tying in the entire perimeter. The critical spot on the fire, in terms of potential fire behavior as shown on Friday afternoon, was the ridgetop from E to G. The Mormon Lake crew was assigned to this portion of the fire. This crew was specifically chosen for this tough assignment by the fire boss, based on the crew's demonstrated capability on the Friday afternoon catline burning out assignment.

The Happy Jack crew was assigned to the burned out south catline and Battlement Creek road (A-D, fig. 21) with instructions to burn out inside Friday's black line and also begin mopup along the outer edge of the burn.

Other crews were on other portions of the fireline, which by now were in mopup stage.

After a general briefing of overhead by the fire boss in fire camp, at about 0700, the Happy Jack and Mormon Lake crews moved out of fire camp for the day shift. The Happy Jack crew hiked up the catline to the east and began firing about 0900 to expand

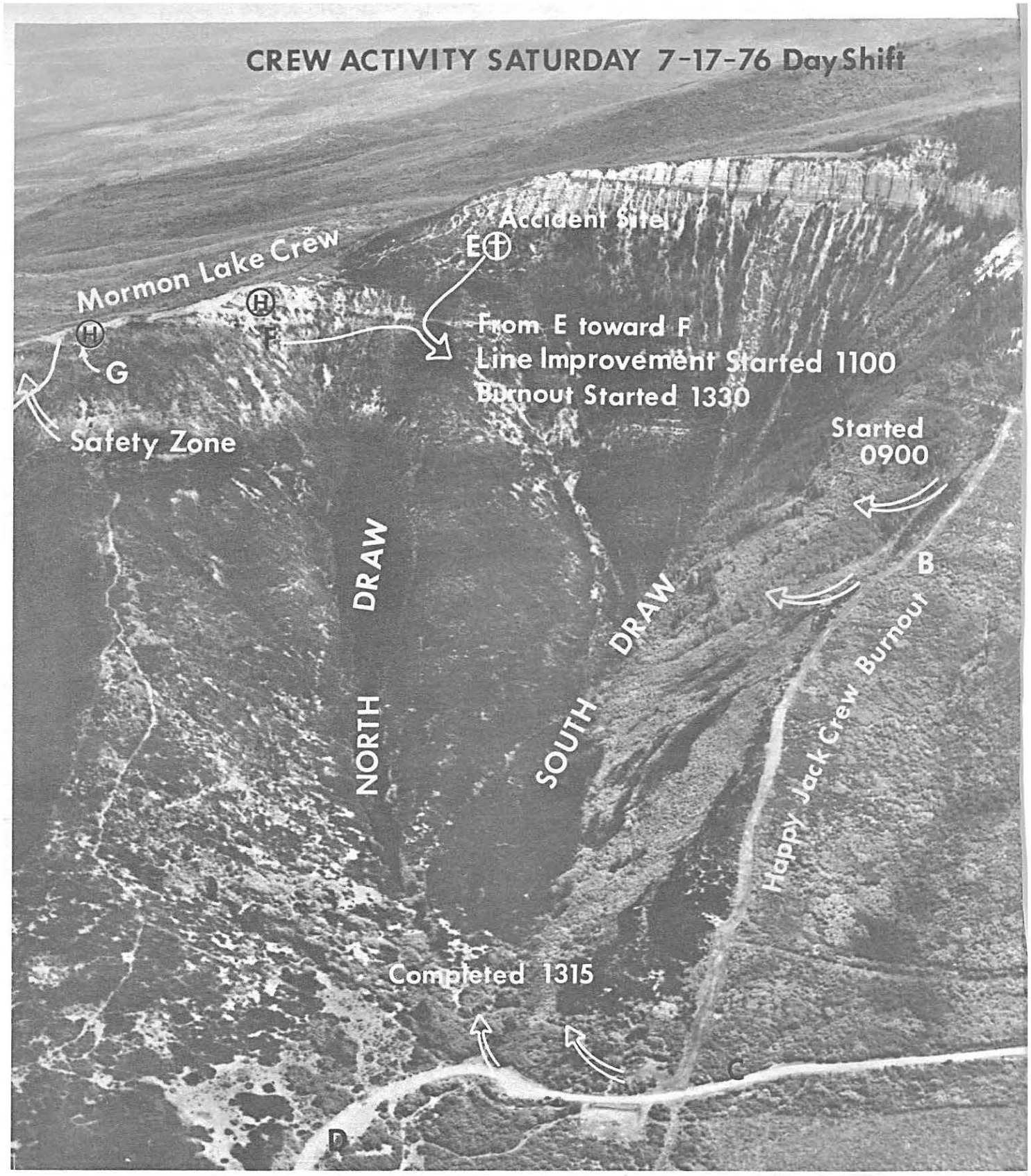

CREW ACTIVITY SATURDAY 7-17-76 Day Shift
Accident Site
E
Mormon Lake Crew
H
H
F
G
From E toward F
Line Improvement Started 1100
Burnout Started 1330
Safety Zone
Started
0900
DRAW
NORTH
SOUTH
DRAW
B
Happy Jack Crew Burnout
Completed 1315
C
D

Figure 21.

Friday's burnout. This burnout continued downhill toward the Battlement Creek road, reaching the road about 1200 (A-B-C, fig. 21). While this was going on, air tankers were laying a retardant line generally from the upper end of the catline, along the base of the rock bluffs, and along the ridgetop toward the cold burn of Friday (A-E-F-G, fig. 21). Air tanker activity continued from 0930 to 1200. The intent of this retardant line was to reinforce the ridgetop handline that would be burned out later in the day.

The Mormon Lake crew arrived at the base heliport along the Battlement Creek road about 0730 and waited until 1030 while the Bell 212 helicopter assigned to the fire was occupied in making three trips to shuttle a crew from Grand Junction to the fire base heliport. When this helicopter became available, about 1030, the line boss, sector boss, Mormon Lake crew boss and a few crewmen made their fire reconnaissance flight over their assigned area (E-G, fig. 21). While airborne, the line boss gave the sector boss and crew boss a thorough briefing as to their handline improvement-burnout assignment, including their planned escape route into the now cold burn of Friday afternoon. The helicopter ferry of the remainder of the Mormon Lake crew was completed soon thereafter, and the entire Mormon Lake crew was at the base of the rock bluff (Point E, fig. 21) about 1100. Improvement of the handline began toward the helispots down the ridgeline (from E toward F, fig. 21). One squad boss with 14 crewmen was assigned to this activity.

The Mormon Lake crew boss had two radios for the day shift--a Coconino NF set allowing him to talk to each of his two squad bosses, each of whom also had only a Coconino radio; and a BLM fire net radio which allowed him to talk to the sector boss, line boss, fire camp, etc. This radio setup allowed the crew boss to communicate both up and down organizationally, but did require two separate radios to do so. Best evidence indicates that all radios functioned normally throughout the day.

The sector boss started the crew boss and one crewman burning out narrow fingers of fuel running up into the rock bluff. Another crewman was stationed on top of the rock bluffs to watch for spots. As this was going on, the bulk of the crew was improving the handline down the ridgetop.

At about this same time, the Happy Jack crew reached the bottom of the catline (Point C, fig. 21). While one squad ate lunch, the other squad continued burning out in the bottom of the draw (C-D, fig. 21), reaching 500 feet or more inside the fire edge. The Friday evening burnout of the lower catline and road had generally resulted in a ground fire, with scorching, but not consumption, of the brush canopy. This draw burned readily, and when firing was completed about 1315, the fire burned uphill toward the Mormon Lake crew. The Happy Jack crew went on to another part of the fire. Apparently, neither crew knew of the specific location or assignment of the other.

When the Mormon Lake line improvement squad had worked about half way down the ridge to the upper helispot (about midway between E and F, fig. 21), the sector boss moved the Mormon Lake burnout squad to the base of the rock bluff to burn out a 60- to 80-foot-wide strip on the west or fire side of the improved line. The burnout squad consisted of the crew boss, one squad boss, and three crewmen. The time was now about 1330.

This burnout progressed slowly, with difficult ignition of the sparse fuels. The crew boss sent one crewman out to the fireline. This crewman later joined the other crewman on top of the rock bluff, leaving the crew boss, squad boss, and two crewmen as the burnout squad. The burnout reached a dense stand of Gambel's oakbrush about one-third of the way from the rock bluff to the upper helispot. The time was now about 1400. This dense brush burned vigorously, and coupled with the noticeable increase in smoke from the draw below the burnout operation, inspired the sector boss (who was located on a rocky point uphill from Point E, fig. 21) to instruct the crew boss to speed up the line improvement squad on toward the safety zone (Point G, fig. 21). He also instructed the crew boss to narrow down and speed up his burnout on down the ridgeline to join the remainder of the crew in the safety zone when his burnout was done.

The sector boss also ordered an air tanker load of retardant to reinforce the fireline. This air tanker was launched at

1410 from Grand Junction airport, with a lead plane for supervision. The lead plane ordered a second air tanker en route.

The sector boss advised the crew boss of the impending arrival of the air tanker and directed the crew boss to move the line improvement squad downhill to the safety zone to avoid possible impact hazard from retardant to be dropped by the air tanker.

Using a crew radio, the crew boss instructed the line improvement squad boss to move on down the ridge to the safety zone and warned him of the impending arrival of air tankers. This squad movement occurred without incident, but the last man had to hurry to avoid the smoke and flames approaching the ridgetop just south of the lower helispot (Point G, fig. 21). The squad boss reported to the crew boss when 14 members of the line improvement squad reached the safety zone. The crew boss relayed this message to the sector boss. The sector boss assumed this meant the entire crew was in the safety zone, not just the line improvement squad. Moments before this message from the crew boss, the sector boss had observed four men moving out of the smoke near where the burnout squad had been and join the line improvement squad. The sector boss assumed these four men were the burnout squad.

Actually, crew boss Czak, with his three-man burnout squad (squad boss Gibson, crewmen Furey and Nelson), was still uphill on the ridgetop, separated by 100-200 yards from the line

improvement squad in the safety zone. The time was now about 1425-1430. The burnout squad tried to reach the safety zone occupied by the line improvement squad but was unable to do so due to the fire front hitting the ridgetop just south of the lower helispot (Point G, fig. 21 --see also figure 17 for photograph of fire at this time). The crew boss then radioed his line improvement squad boss in the safety zone that he and the burnout squad were "trapped" and unable to join them in the safety zone. This radio conversation was calm, without any sign of panic, and the line improvement squad boss interpreted this only as meaning the burnout squad was temporarily cut off from the safety zone.

The crew boss also radioed the sector boss that he was unable to get into the planned safety zone and told the sector boss that he was proceeding back up the ridgetop fireline toward the rock bluff. The sector boss was dismayed to learn that the burnout squad was not already safely with the line improvement squad, as he had thought earlier. The sector boss told the crew boss that because of heavy smoke obscuring the sector boss's visibility, he could not advise him on an escape route. The crew boss and his three-man burnout squad then started rapidly back uphill southerly along the ridgetop toward the rock bluffs (approximately from F toward E, fig. 21). The time was now 1430-1435. The sector boss tried unsuccessfully several times during the next 20 to 30 minutes to contact the crew boss by radio.

Fire-induced winds had now increased, and as the first air tanker from Grand Junction arrived about this time, it was unable to drop along the ridgeline (where the burnout squad was), as requested by the sector boss. Heavy smoke and strong, erratic winds prevented the drop where requested. A few minutes later, the air tanker made a drop diagonally across the ridgeline approximately at the base of the rock bluffs. This had no effect on the burnout squad.

About 1440, the burnout squad was unable to proceed any further uphill along the ridgeline toward the rock bluffs. Their movement was stopped (at Point E, fig. 21) by heavy smoke and flames, perhaps from their wind-fanned burnout hitting against the fireline along which the crew had been moving.

Upon orders from the crew boss, they removed their canvas cruiser vests, moistened the vests and their shirts and trousers with water from their canteens, and laid face down in the mineral soil of the fireline. They covered their heads and faces with the moistened canvas vests. All had aluminum cap-style hard hats, Nomex fire-resistant shirts, and non-fire-resistant work trousers. All four men were close enough to touch each other. The flames and smoke roared overhead. The time was about 1440-1445.

B. Post-Accident Rescue and Medical Action

While the fire was overrunning the four burnout squad members shortly before 1448 m.d.t. July 17, 1976, crewman Nelson stood up from his prone position on the fireline (their attempted

refuge point), shouted, "I'm on fire," and ran downhill into the fire area below the burnout squad position. His body was later found with his burned watch nearby stopped at 1448. He was badly burned.

Shortly after Nelson left the burnout squad position, crew boss Czak stood up, shouted unintelligibly, and ran generally down the ridgeline. His body was later found approximately 1,100 feet away from the burnout squad refuge position. He was burned, but much less so than Nelson.

Crewman Furey and squad boss Gibson remained, apparently in a prone position in the burnout squad location. Both were burned as the fire swept over them. Furey's work trousers and fire-resistant shirt were burned entirely off his back except for small fragments. He was in considerable pain. Gibson advised Furey to remain on the ground, to try to rest, that help was on the way. Gibson heard a helicopter overhead at this time.

Sector boss Coleman arrived at the Furey-Gibson location about 1510. Coleman radioed word of the accident to the fire boss and quickly checked the immediate area for other burnout squad members. He found no one else in the immediate area. Using a Coconino crew radio he found at the scene, Coleman then summoned Kimball, squad boss of the line-building portion of the Mormon Lake crew, from their refuge in the burned area below the helispot. Coleman instructed Kimball to bring his squad from their refuge in the burned area and to come up the ridgeline

to the Furey-Gibson location to help locate the missing men (Czak and Nelson).

About this time, Furey stopped breathing, so Coleman began mouth-to-mouth resuscitation. While this resuscitation effort was going on, Safety Officer Bellar and Maps and Records Officer Woody were en route by helicopter to the helispot just downhill from Coleman's location. They had first aid equipment with them. Coleman continued resuscitation efforts on Furey for about 15 minutes until Bellar and Woody arrived. Bellar, a trained emergency medical technician, checked Furey's life signs, which indicated no sign of life. Coleman was unable to detect any signs of life all the time he was administering resuscitation to Furey. The group decided that any further efforts at resuscitation on Furey were useless, and turned their efforts to aid Gibson, who was seated nearby. Gibson was in considerable pain.

Gibson was half-carried, half-walked, downhill to the helispot and boarded the waiting helicopter. Mormon Lake crewman Armstrong also boarded the helicopter to assist Gibson. The helicopter was airborne at 1553 and landed at St. Mary's Hospital, Grand Junction, at 1610. Gibson was admitted to the emergency room and received treatment from Dr. G. R. Kempers. Upon the recommendation of the staff at St. Mary's Hospital, Gibson was transferred to the Burn/Trauma Unit at Bernalillo County

Medical Center, Albuquerque, New Mexico, the next day, Sunday, July 18. He is presently (August 4) recovering at that hospital. His medical prognosis appears favorable.

While Gibson's evacuation was going on, the Mormon Lake crew and others were searching for the other two missing burnout crew members. Nelson's body was located, and shortly thereafter, Czak's body (fig. 22a, 22b). The fire boss had earlier requested both a doctor and emergency medical technician. Dr. J. L. Sisk of Rifle and EMT Steve Miller of St. Mary's Hospital, Grand Junction, arrived separately by helicopter about 1700. Czak, Furey, and Nelson were pronounced dead on the scene. Garfield County Coroner O. L. Sowder of Rifle arrived later by helicopter and aided in the helicopter transport of the bodies to the Sowder Funeral Home in Rifle.

Because of the lack of facilities at Rifle, no autopsies were performed. The bodies were shipped by air to mortuaries in the victims' home towns. (Czak to Flagstaff, Arizona; Furey to Salmon, Idaho; Nelson to Bloomer, Wisconsin.) A member of the Mormon Lake crew accompanied the bodies as escorts to their home towns.

The Garfield County (Colorado) Coroner's Office reports show asphyxiation as cause of death for Czak, Furey, and Nelson.

All the burn victims wore fire-resistant shirts (GSA Stock No. 8415-00-233-5819), which were apparently in good condition

prior to the fire. All wore work trousers which were not fire-resistant. In addition, all wore Filson canvas cruiser vests over their fire-resistant shirts. These vests were removed, moistened by water from canteens, and draped over the men's heads for facial and respiratory protection. All wore aluminum cap-style hard hats during this time. All laid face down in the mineral soil of the fireline which had a shallow (12-18 inches) depression at this point (fig. 23). None had fire shelters.

Fabric samples of work trousers and fire-resistant shirts from the dead firefighters have been submitted to FS Missoula (Montana) Equipment Development Center for further technical analysis.

IV. INVESTIGATION

Grand Junction BLM District Manager Tom Owen was notified of the accident at approximately 1520, Saturday, July 17. Colorado BLM Safety Officer Dick Huff and Grand Junction staffman Gus Juarez were immediately involved with investigative action and followup medical matters and care of the bodies.

The following sequence of events covers the time period from the accident to the initial investigation:

July 17

1600 - (Approx.) Safety Officer Bellar marked location of victims and collected personal effects.

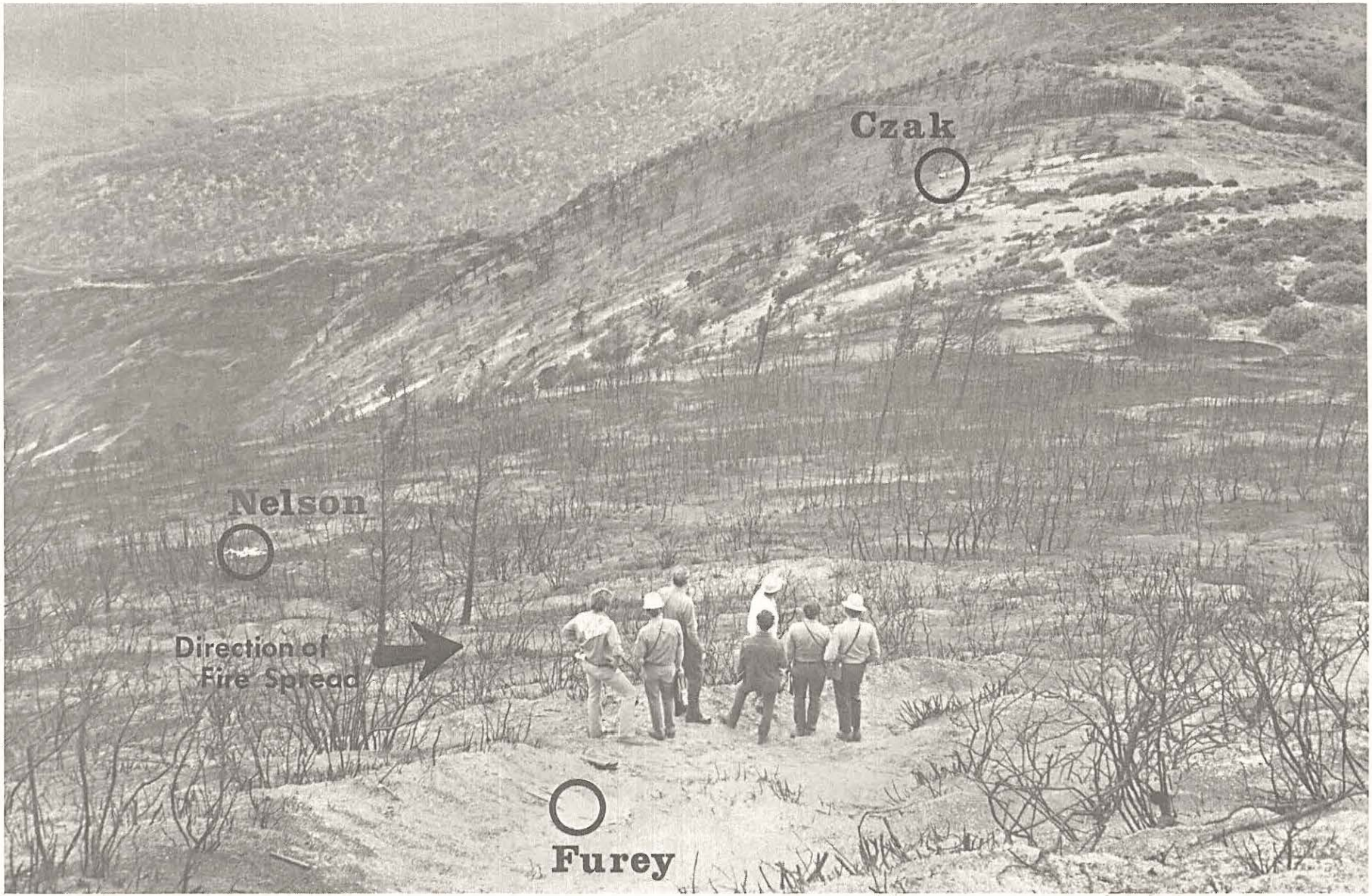


Figure 22a.--Scene showing refuge site of burnout squad (Furey location, foreground) and final location of individual burn victims by name. Measured slope distance along fireline from Furey location to Czak location about 1,100 feet.

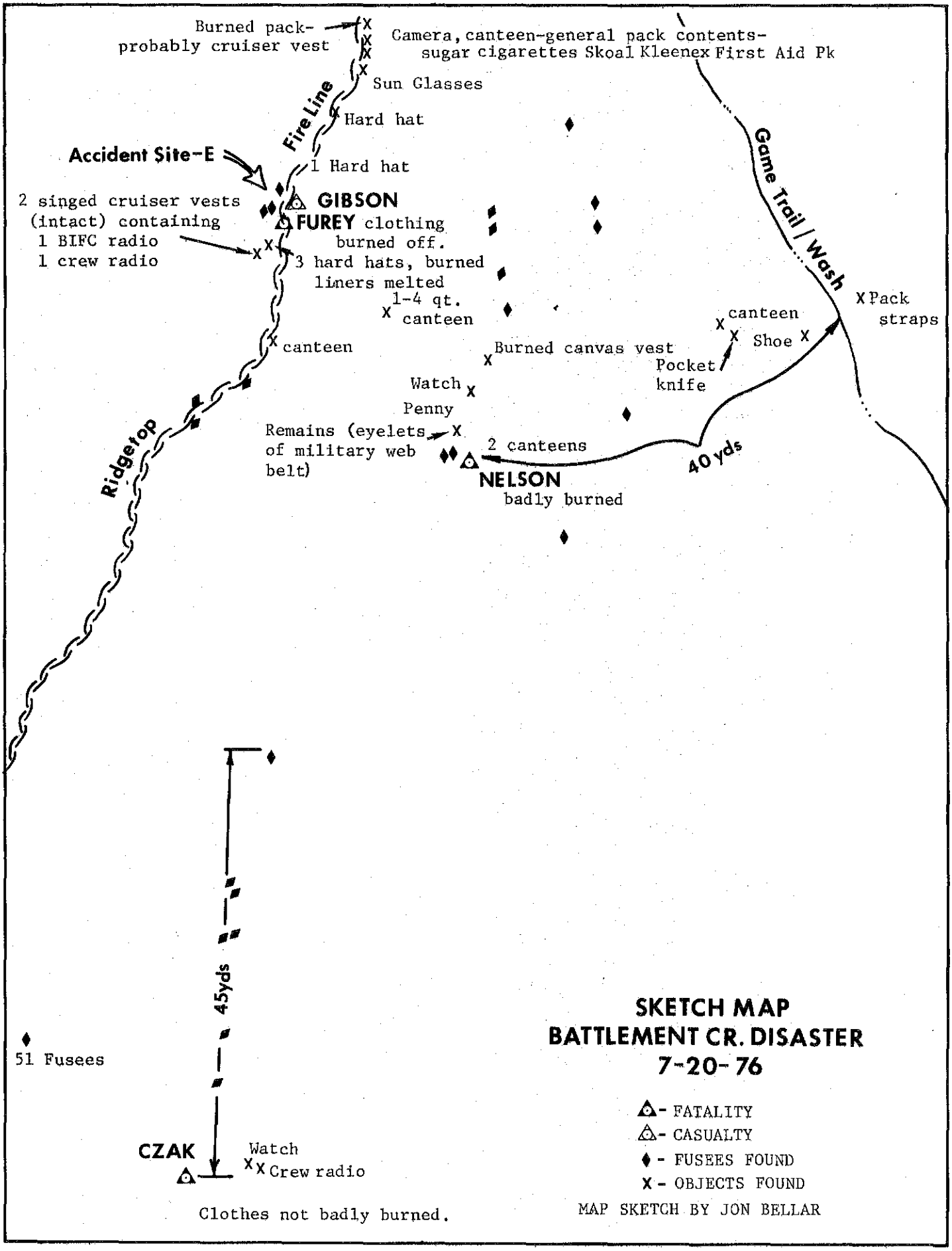

Burned pack-
probably cruiser vest
Camera, canteen-general pack contents-
sugar cigarettes Skoal Kleenex First Aid Pk
Sun Glasses
Fire Line
Hard hat
Accident Site-E
1 Hard hat
2 singed cruiser vests
(intact) containing
1 BIFC radio
1 crew radio
GIBSON
FUREY clothing
burned off.
3 hard hats, burned
liners melted
1-4 qt.
canteen
canteen
Burned canvas vest
canteen
Shoe
Pocket
knife
Pack
straps
Game Trail / Wash
Watch
Penny
Remains (eyelets
of military web
belt)
2 canteens
NELSON
badly burned
40 yds
Ridgetop
45yds
51 Fusees
CZAK
Watch
Crew radio
Clothes not badly burned.
SKETCH MAP
BATTLEMENT CR. DISASTER
7-20-76
- FATALITY
- CASUALTY
- FUSEES FOUND
- OBJECTS FOUND
MAP SKETCH BY JON BELLAR

Figure 22b.

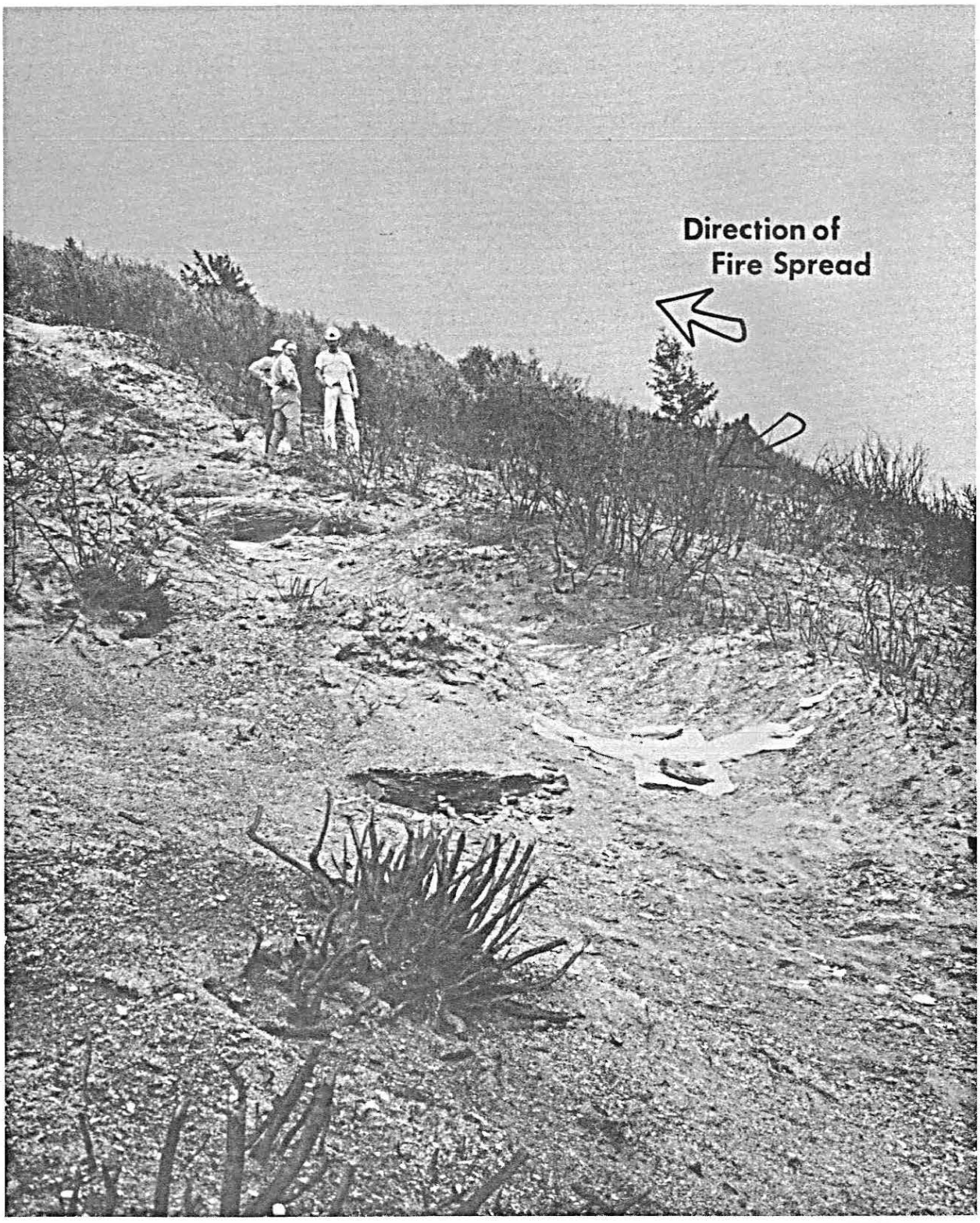


Figure 23.--Ridgetop fireline refuge site of burnout squad. X shows location of Furey's body.

1615 - Huff and Juarez talked to Mormon Lake crew member Armstrong at St. Mary's Hospital in Grand Junction. Armstrong had accompanied injured squad boss Gibson. Completed CA-16 at that time.

1730 - Huff and Juarez met remainder of Mormon Lake crew at airport, began taking statements.

2130 - Huff and Juarez took statements from remainder of crew at airport.

2230 - District personnel Owen, Juarez, Johnson and Byron Kropf of the BLM Colorado State Office met with fire overhead Haslem, Coleman, Smith, Bartlett, Kellogg, Putnam and Woody to review accident and fire plans.

2300 - District Manager Owen ordered a departmental project overhead team to relieve present team.

2330 - Huff and Juarez interviewed survivor at St. Mary's Hospital. Gibson was sedated and in pain. A nurse was present during the 20-minute interview.

0100 - Fire overhead team returned to fire camp.

July 18

Huff collected statements from coroner and doctor. Also coordinated reports and records requirements with R-3 fiscal management and the crew's home unit, the Coconino National Forest.

1630 - Four members of investigation team BIFC arrived at Grand Junction. The three remaining team members arrived that night and the next morning.

1800 - New overhead team relieved team on fire.

1930 - Team members Wilson, Heilman, Mutch, and O'Dell interviewed Mormon Lake squad boss Kimball.

July 19-24

Team members continued field investigation.

July 24-August 3

Individual team members continued work on assigned portions of report.

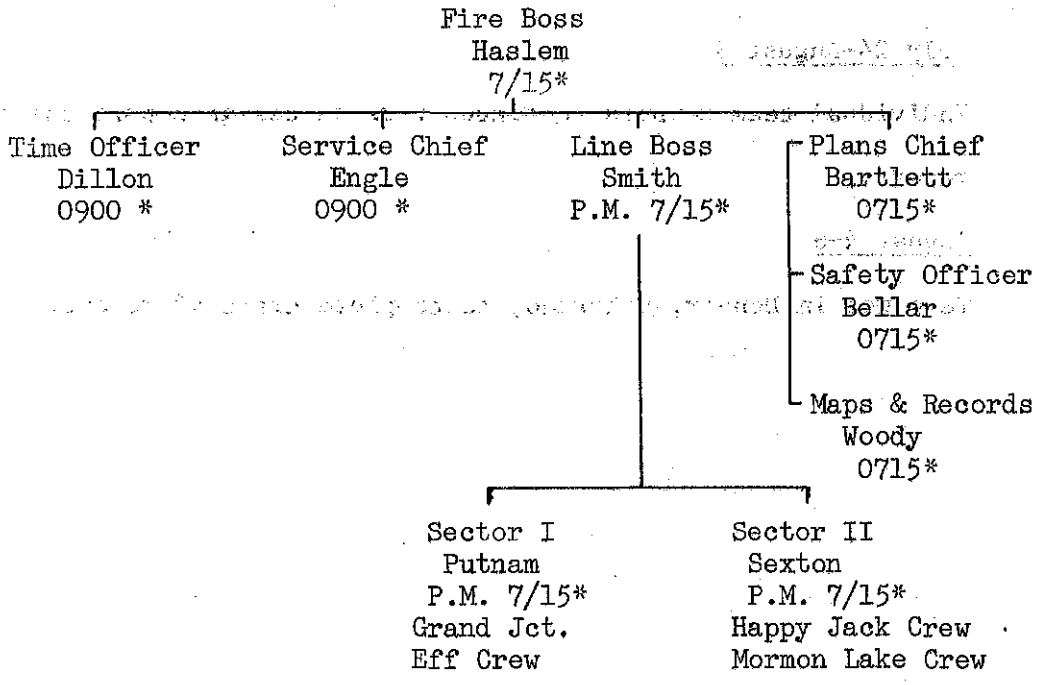
August 4-6

Team met in Denver, Colorado, to complete draft of report.

V. ORGANIZATION AND MANAGEMENT - Battlement Creek fire

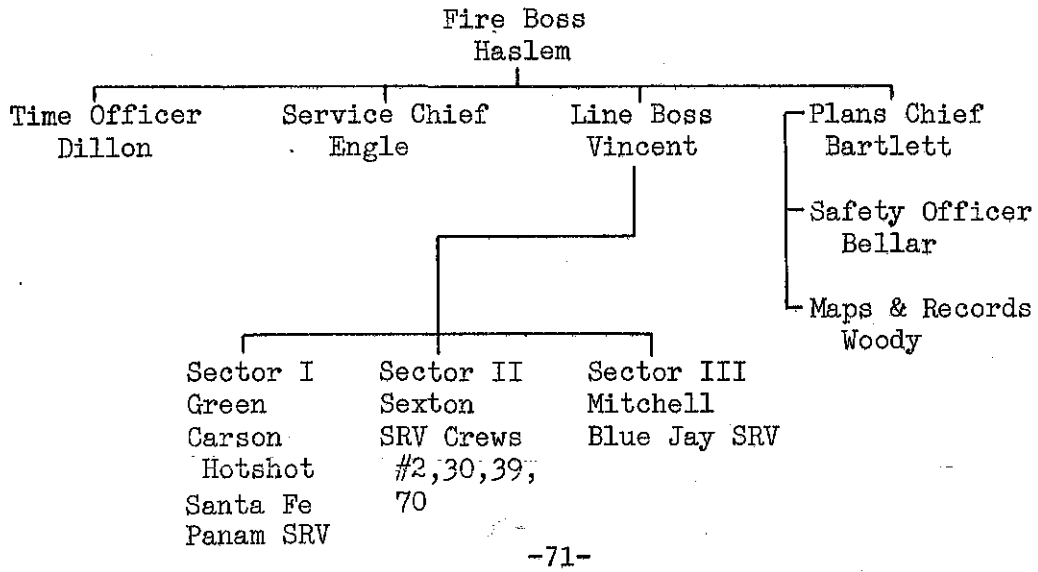
A. Fire Overhead and Crew Assignments 7/16-7/17/76

7/16 DAY SHIFT

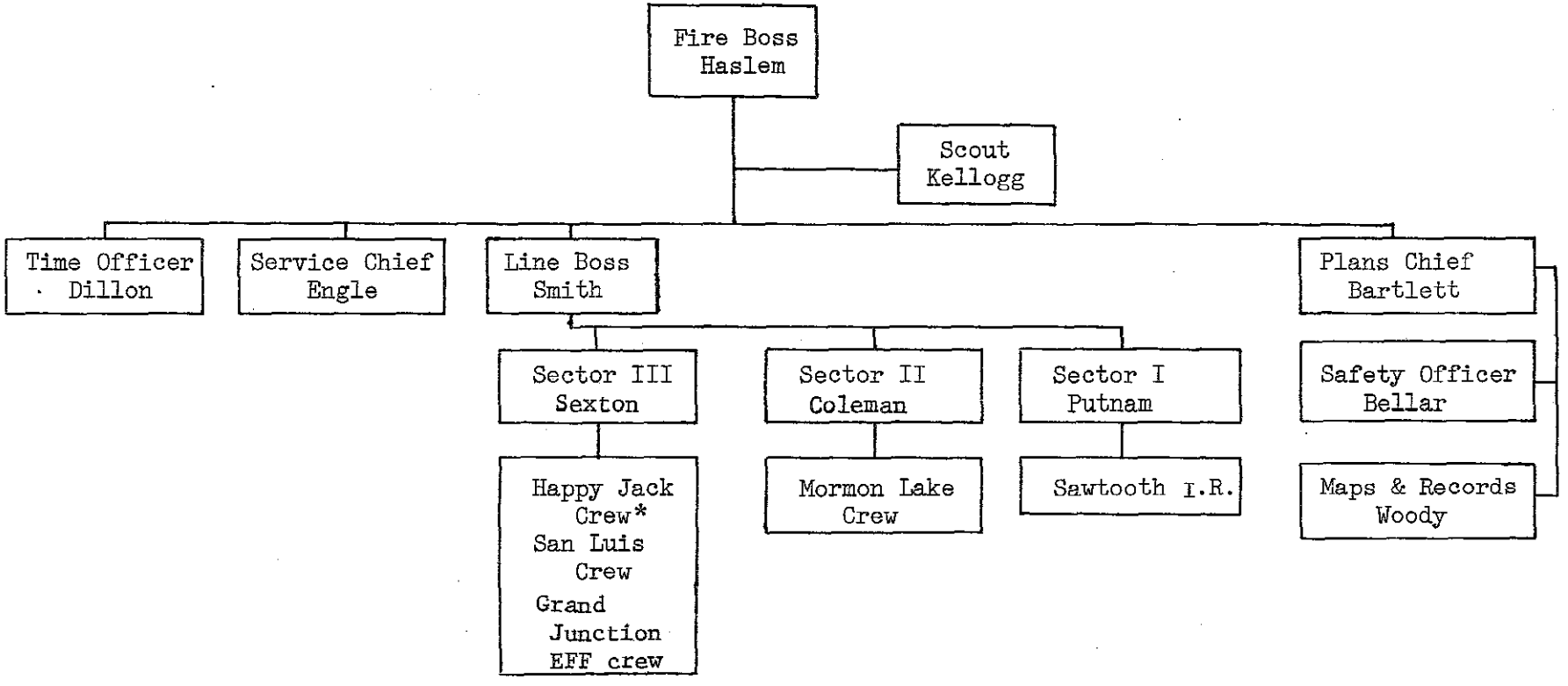


* Arrival at Grand Junction and assumption of responsibility

7/16 NIGHT SHIFT



FIRE ORGANIZATION
7/17/76 Day Shift



*moved to Sector I approximately 1330
after burnout completed.

See figures 24 and 25 following.

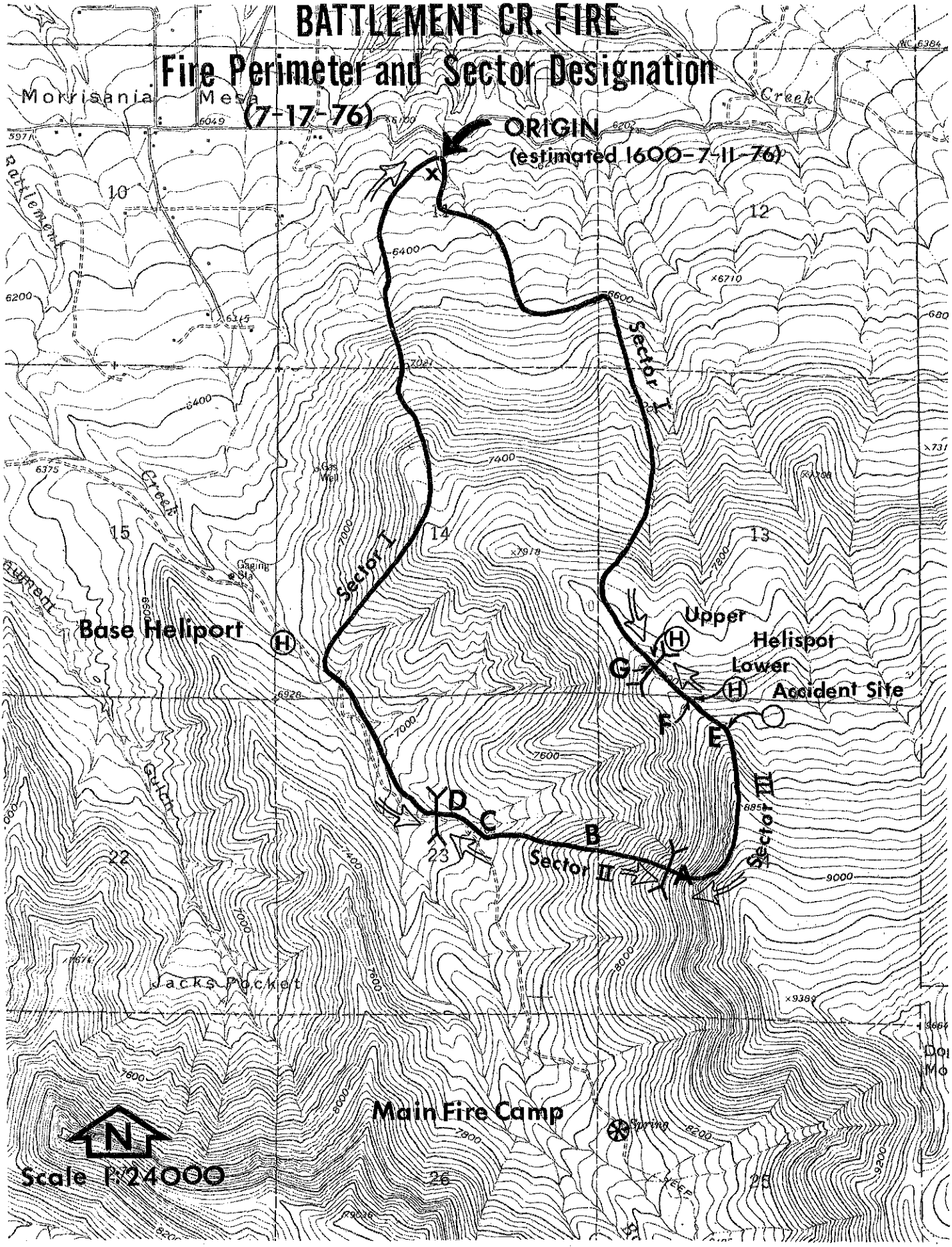

BATTLEMENT CR. FIRE
Fire Perimeter and Sector Designation
(7-17-76)
ORIGIN
(estimated 1600-7-11-76)
Morrisania Mesa
Creek
Sector I
Sector II
Sector III
Base Heliport
Upper Helispot
Lower Accident Site
Main Fire Camp
Jacks Pocket
Gulch
Creek
Spring
A
B
C
D
E
F
G
10
11
12
13
14
15
22
23
26
25
Scale 1:24000

Figure 24. -73-

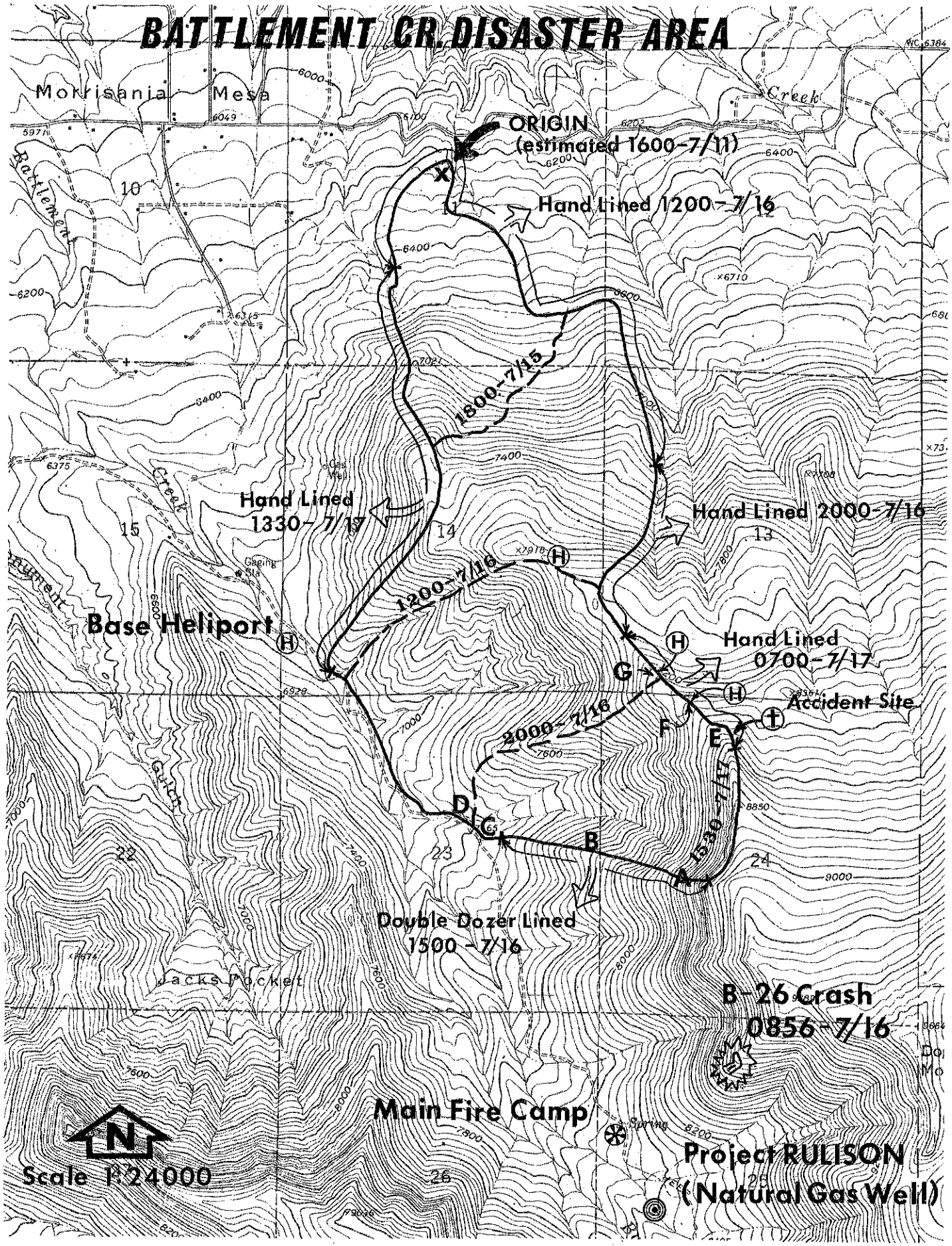

BATTLEMENT CR. DISASTER AREA
Morrisania Mesa
Creek
ORIGIN
(estimated 1600-7/11)
Hand Lined 1200-7/16
1800-7/15
Hand Lined
1330-7/17
Hand Lined 2000-7/16
1200-7/16
Base Heliport
Hand Lined
0700-7/17
Accident Site
2000-7/16
1530-7/16
Double Dozer Lined
1500-7/16
B-26 Crash
0856-7/16
Main Fire Camp
Project RULISON
(Natural Gas Well)
Jacks Pocket
Scale 1:24000

Figure 25. -74-

B. Overhead Qualification and Experience

District Manager Tom Owen with the advice of Roy Johnson, Fire Control Officer, initially assigned District employee Joseph Haslem as fire boss. They also requested two crews and two sector bosses at that time. Subsequent orders for specific overhead were determined by fire boss Haslem and transmitted to BIFC by Grand Junction Dispatch Center. BIFC coordinators followed the normal procedure of requesting overhead by position from units adjacent to the fire. In this case, requests were filled by fire control personnel stationed at BIFC and Wyoming BLM at Lander and Rawlins. In addition, several local Grand Junction District personnel were assigned, including Bureau of Land Management and Forest Service detailers previously assigned at the Grand Junction Fire Center. A summary of orders placed with BIFC for this fire on July 15 and 16 follows.

Overhead orders received at BIFC 7/15 and 16, 1976 from Grand Junction, Battlement Creek fire.

7/15 2340 -
BIFC #760970

1 Safety Officer, Wyoming BLM, J. Bellar
2 Sector Bosses, Wyoming BLM, G. Green and M Woody
BIFC, T. Sexton, B. Mitchell
4 Heliport Mgr's, R-4, R. Patterson, D. Hamrick, Geo. Starr; BIFC, R. Everson
1 Timekeeper, BIFC, Cindy Dillion
1 Line Boss, BIFC, R. Vincent
1 Service Chief, BIFC, D. Engle
1 Plans Chief, Wyoming BLM, B. Bartlett

7/15 2355 -
BIFC #760971

3 Ramp Personnel
2 Helicopter Managers Class 1, R-4

7/16 0800 -
BIFC #760974

1 Logistics Team, BIFC, B. Carr and J. Reginato
1 Supply Officer, BIFC, M. Mitchell
1 Timekeeper, BIFC, L. Johnson
1 Tool Mgr., BIFC, R. Weeks

7/16 2005 -
BIFC #760996

1 Ass't. Supply Officer, BIFC, Campbell
1 Ass't. Camp Officer, BIFC, D. Call
1 Air Service Mgr., Helicopter (trainee), BIFC, B. Carlton

For several years, the BLM and the Forest Service have used similar but somewhat different qualification criteria for certifying individuals for specific fire suppression positions. The differences have been in the amount and currency of experience and the type of formal training required. In 1974, the agencies jointly developed a common qualification system which combined the strong aspects of both systems. The new system is currently in the process of being adopted and is used by all Forest Service units. The BLM has begun to implement the system through designation of two states and the Boise Interagency Fire Center as test units.

Consequently, personnel on the Battlement Creek fire were rated on two systems: the old BLM system and the new Interagency Fire Qualification System. Requirements in the new system are considerably more demanding in terms of training and experience, and in addition, require a high level of physical fitness based on aerobic (oxygen) capacity.

The following table contains the fire assignment and the qualification rating according to the system by which the individuals were rated for key overhead assignment to the Battlement fire on July 16 and 17.

An individual summary of key overhead showing work experience and training relevant to the position in which they were assigned on the Battlement Creek fire follows:

Name	Regular Duty Station	Arrival On Fire	Battlement Fire Assignment 7/15-7/18	Fire Qualification Card Rating
Joseph Haslem	Grand Junction BLM Colorado	7/15	Fire Boss	Fire Boss I
Walt Smith	Aerial Fire Depot, FS Missoula, Montana	7/16	Line Boss (day)	Division Boss
William Bartlett	Rawlins District, BLM Wyoming	7/16	Plans Chief	Plans Chief II
Dave Engle	BIFC-BLM	7/16	Service Chief	Service Chief II
Monford Woody	Rawlins District, BLM Wyoming	7/16	Maps and Records	Plans Chief II
Jon Bellar	Rawlins District, BLM Wyoming	7/16	Safety Officer	Safety Officer
Jim Sexton	BIFC - BLM	7/16	Sector Boss	Sector Boss
Leonard Coleman	Grand Junction BLM Colorado	7/16	Sector Boss	Sector Boss
Ted Putnam	Aerial Fire Depot, FS Missoula, Montana	7/16	Sector Boss	Crew Boss
Don Kellogg	Grand Junction BLM Colorado	7/16	Scout	
Rick Vincent	BIFC-BLM	7/16	Line Boss (night)	Line Boss II
Cindy Dillon	BIFC-BLM	7/16	Finance Chief Time Officer	Time Officer
Steve Cornell	BIFC-BLM	7/16	Crew Liaison Off.	Crew Boss
Bill Mitchell	BIFC-BLM	7/16	Sector Boss	Division Boss
Gale Green	Rawlins District, BLM Wyoming	7/16	Sector Boss	Sector Boss

(all except Smith and Putnam rated on BLM system)

Jack Haslem, Fire Boss I (rated by BLM system)

Experience:	Fire Boss I - 3 fires since 1974
Recent Training:	Fire Command 1975 Fire Generalship 1976

Walt Smith, Division Boss (rated by Interagency Fire Qualifications System)

Experience:	Division Boss - 1 fire Sector Boss - 3 fires
Work History:	Smokejumper and crewman - many fires
Recent Training:	Sector Boss Intermediate Fire Behavior

William Bartlett, Plans Chief II, rated by BLM System

Experience:	Worked in plans function in 1974.
Work History:	Varied experience as crew boss on small fires in past three years.
Recent training:	Plans and Service functional training in 1974.

Dave Engle, Service Chief II (rated by BLM System (only person in Service Section on July 17)

Experience:	Served as service chief on one fire in 1975. Also limited experience in other service functions, especially heliport and air service areas.
Work History:	Numerous crewman and crewboss fires.
Recent Training:	Fire organization and Management Training in 1975.

Cindy Dillon, Time Officer (rated by BLM System (only person in finance section))

Experience:	Timekeeper on 7 fires.
Work History:	Limited additional fire experience
Recent Training:	Finance Training 1976.

Leonard Coleman, Sector Boss (rated by BLM system)

Experience: Two fires in sector boss position.

Work History: Numerous small fires as crewman and crew boss.

Recent Training: BLM Fire Academy.

Ted Putnam, Crew Boss (rated by Interagency Fire Qualification System)

Experience: First fire in Sector Boss capacity. Numerous fires as crewman and smokejumper.

Recent Training: Sector Boss Training 1975.

Don Kellogg: Served as scout or observer for fire boss. Not rated by qualification system.

Experience: None on fire team.

Training: None.

C. Crew Qualification and Experience

Crews assigned to the Battlement Creek fire were organized Forest Service interregional or hotshot crews, Snake River Valley organized Mexican-American crews, and a newly formed emergency crew from Grand Junction. With the exception of the Grand Junction crew, all crews were well-trained and experienced. Most had been assigned to several fires in similar conditions this year. This was the seventeenth fire of the first season of the newly formed Mormon Lake crew, of which five had been large brush or timber fires.

The Mormon Lake crew boss, squad bosses and crewmen all had completed training requirements for their positions and had been actively involved in refresher training sessions.

A summary of the experience and training of this crew follows:

EMPLOYMENT HISTORY - MORMON LAKE HOTSHOT CREW

CZAK - Crew Boss (deceased)

5/73-8/73	Hotshot Crew, Flagstaff RD, Coconino NF	
5/74-8/74	Hotshot Crew, Blue Ridge RD, Coconino NF	Squad Boss
4/75-11/75	Hotshot Crew, Blue Ridge RD, Coconino NF	Squad Boss - Crew Boss
3/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino NF	Crew Boss
Training	S-100, 110, 130 230, 230, 270	

Total Time 17 Months

FUREY - Crewman (deceased)

6/73-8/73	Salmon National Forest	Pumper Crewman
6/74-8/74	Salmon National Forest	Pumper Crewman
5/75-8/75	Salmon NF	Helitack Crew.
4/76-7/76	Mormon Lake RD, Coconino NF	Hotshot Crewman
Training	S-100, 110, 130, 190	

Total Time 10 Months

NELSON - Crewman (deceased)

5/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino	Crewman
Training	S-100, 110, 130, 190	

Total Time 2 Months

GIBSON - Squad Boss (hospitalized)

5/75-12/75	Hotshot Crew, Blue Ridge RD, Coconino
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino
Training	S-100, 110, 130, 190

Total Time 10 Months

KIMBALL - Squad Boss

9/70-12/70	San Bernardino NF	Various Dist. Supp. Crews
6/71-12/71	San Bernardino NF	" " " "
3/72-8/72	San Bernardino NF	" " " "
5/75-10/75	Hotshot Crew, Blue Ridge RD, Coconino NF	
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino NF	
Training	S-100, 110, 130, 190	

Total Time 22 Months

MORMON LAKE HOTSHOT CREW
May 30, 1976 - Coconino NF, Arizona

(Front Row, Left to Right) - John Gibson (squad boss), Rich Mahrt, Ronald Pavatea, Tony Czak (crew boss), Bud Caylor (DFMO), Scott Nelson, Richard Graham
(Center Row, Left to Right) - Carl Armstrong, Tony Strayhand, Steve Furey, Tom Kwiatkowski
(Back Row, Left to Right) - Quane Wofford (with hat), John Simpson, John Meyers, Pat Booth, Don Kimball (squad boss)

MAHRT - Crewman

5/75-7/75	Coronado NF	Fire Prevention Tech.
8/75-12/75	Los Padres NF	District Supp. Crew
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino	
Training	S-100, 110, 130, 190	
		Total Time 10 Months

CASCIANA - Crewman

4/74-11/74	Hotshot Crew, Blue Ridge RD, Coconino
4/75-11/75	Tanker Crewman, Blue Ridge, Coconino
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino
Training	S-100, 110, 130, 190
	Total Time 16 Months

ARMSTRONG - Crewman

7/74-7/74	Quemado RD, Gila NF	Misc. Project Work, Some Fire
3/75-11/75	Quemado RD, Gila NF	Tanker Crewman
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino	
Training	S-100, 110, 130, 190	
		Total Time 13 Months

PAVATEA, R. - Crewman

4/72-7/72	Alpine RD, Apache NF	Helitack Crew
4/73-5/73	Alpine RD, Apache NF	" "
7/73-12/73	Hotshot Crew, Flagstaff RD, Coconino	
5/75-6/75	Truckee RD, Tahoe NF	Project & Fire
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino	
Training	S-100, 110, 130, 190	
		Total Time 13 Months

PAVATEA, E. - Crewman

5/75-9/75	Truckee RD, Tahoe NF	Project & Fire
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino	
Training	S-100, 110, 130, 190	
		Total Time 7 Months

WOFFORD - Crewman

4/72-10/72	Hamilton RD, Bitterroot NF, Montana	Project & fire
4/73-10/73	Darby RD, Bitterroot NF, Montana	Suppression crew
5/75-11/75	Hotshot Crew, Blue Ridge RD, Coconino	
4/76-7/76	Hotshot Crew, Mormon Lake RD, Coconino	
Training	S-100, 110, 130, 190	

Total Time 21 Months

KWIATKOWSKI	Crewman	First Season	Maximum 3 months
SIMPSON	"	"	"
BOOTH	"	"	"
STRAYHAND	"	"	"
SUTTON	"	"	"
DAVIS	"	"	"
ELY	"	"	"
SULLIVAN	"	"	"
MEYERS	"	"	"

Training S-100, 110, 190

D. Logistical Support

Logistical support for the Battlement Creek Fire was provided by the Grand Junction fire center at Walker Field. They in turn would draw on BIFC for requests beyond local capability. In addition, on July 16 a special logistical support office was established in Grand Junction to handle direct orders from the fire.

There were no manpower or materiel shortages during the time of the fire. All confirmed requests were filled. A problem did occur in ordering procedures and followup in fire camp. While this did affect some materiel orders, it did not appear to be a major problem.

E. Fire Planning and Intelligence

There was no functioning system of planning and intelligence gathering on this fire. One individual served as an observer or scout for the fire boss. The plans section operated with a plans chief and one individual initially assigned as maps and records officer, but due to other demands by the fire boss, served in this role part-time.

The procedure for transmitting information consisted of fire boss briefings to line personnel before going on shift. This was always verbal with no written instructions or maps provided. Personnel briefed varied, but always included the line boss, and usually the sector bosses. Written plans were prepared after the briefing as a record.

There was no system of information exchange between line personnel working different shifts. Transfer of information was accomplished verbally by the fire boss.

Helicopters were used by the line boss, sector boss and crew boss for aerial reconnaissance prior to going on shift. Such a flight was taken by Smith, Coleman, and Czak on July 17. There were no helicopter reconnaissance flights made later during the day, until the rescue activities commenced.

F. Aviation Management Activity

There were no aircraft shortages during the fire. On the afternoon of July 15, aerial tanker (T59), a B-26, was available at Walker Field at Grand Junction. This aircraft, and a Bell 206-B Jet Ranger helicopter, No. 654 W, were the initial attack complement for the Grand Junction District. Because of the serious nature of this fire season, a Bell 212 helicopter was also at Walker Field. There were other retardant aircraft and light helicopters within a 2-hour radius.

At approximately 1615 on July 15, the Bell 212 helicopter was grounded for failure of a vital instrument, and replaced by a Bell 205 helicopter from Boise at 2200. An additional C-119 air tanker from Winslow, Arizona (Tanker 138) arrived at approximately 1914. Air tanker No. 56, a B-26, from Denver, also arrived July 15.

There were several other smaller ongoing fires beside the Battlement Creek fire No. 1173 where aircraft were being used.

By 1000 on July 16, the Bell 212 helicopter was back on the line. According to the Grand Junction Fire Center, the following aircraft were available and being used on the Battlement Creek fire:

Helicopter 212	81FC
Helicopter 205	440AS
Helicopter 206B	654W*
Baron Lead Plane	98W
Tanker, B-26	T-59*
Tanker, B-26	T-56 (crashed 7/16)
Tanker, C-119	T-138
Light Twins	?

*primary initial attack ships used on the Battlement Creek fire.

On July 16, most of these aircraft used either their allowed flight times or duty hours, resulting in a shortage of pilot hours prior to 0800 on July 17.

There was some confusion between the Battlement Creek fire boss and the local organization as to availability of the Bell 206B helicopter for the fire. The Grand Junction Fire Center view was that the ship was assigned to Fire No. 1173 and available for call. The fire boss view was that this was the District initial attack ship, and was to be used sparingly.

On the day of the incident--July 17--major aircraft use on the Battlement Creek fire was as follows:

Helicopter 212	Helicopter 205	Jet Ranger 206B
0858 to 1140 Ferrying San Luis Crews (27 men) - G. Jct to Fire Helispot #1. 1300 to 1320 Grand Junction - Grand Valley. Loaded LA* tank and dropped water on spots on NW corner of fire. 1430 to 1515 Was over Fire #1173 until ordered to Camp Helispot to pick up Safety Officer and Emergency Supplies and go to Heli. #2 on top. 1515 to 1918 Working on rescue and fire operation.	0800 to 0830 Took air accident investigating team to air tanker crash site. 0845 Refuelled at river. 0915 to 0945 Flew overhead crew over fire for reconnaissance. 1000 to 1100 Hauled Mormon Lake Crew to Helispot #2 and ferried Blue Jay Crew to base heliport. 1200 to 1230 Returned to G. Jct. for initial attack. 1515 Dispatched to Fire #1173 - no sign of emergency mission) 1515 to 1922 Rescue, evacuation on Fire #1173.	1015 to 1138 Attached to Fire No. 1172. 1153 to 1445 Picked up litters and flew to Heli. #2 on Battlement Cr. Fire. 1602 to 1921 Evacuation and fire #1173 operation.

* Special helicopter tank developed by Los Angeles County for dropping liquids.

Aircraft communication over the fire was on FAA frequency 122.9 MHZ. There was no overall air management officer, but lead plane 98W directed air tanker operations. Coordination was accomplished through constant monitoring of 122.9 MHZ and USFS air net in the lead plane, air tankers, and large helicopters. The line boss also carried the air net. Aircraft were ordered through the Grand Junction Dispatch Office, although it has not been possible to establish firmly who determined priorities.

Responsibility for fire heliport management was assigned to Mike Campbell at 0600 on July 17. He immediately moved the base heliport to a new location 2 miles north of the fire camp.

Aircraft facility management at Grand Junction functioned satisfactorily under crowded conditions. The area was quite congested, especially when large transport aircraft arrived. The ramp operation was tightly controlled, and security was present. The retardant plant was operated by Jim McKay of USFS.

In brief recapitulation, there was minimal overall aircraft coordination or management during this multiple fire complex. Even though ample aircraft were readily available, they were not used for reconnaissance or intelligence gathering on this fire the day of the accident, except for one flight approximately 4 hours before the accident. There was no tight and understood aircraft use scheduling. Aircraft communications, though successful, were minimal, and priority setting for aircraft use was not definite.

VI. FINDINGS

A. Mechanical Factors

There were no mechanical failures that contributed to the accident.

On-fire radio communication equipment was adequate.

Adequate air support and line workers were available.

The Mormon Lake Crew was wearing the latest Nomex fire resistant shirts.

Fire shelters were not used. They were not requested or supplied to the fire.

Fire shelters might have prevented the fatalities at the refuge site. Additional data to confirm this has been requested from Missoula Equipment Development Center.

Policy on issuing and carrying shelters has not been established for the BLM in Colorado.

B. Physical Factors

Fire behavior was not unusual and was reasonably predictable.

Fire was dominating the local winds at time of accident, not vice versa.

Fuel condition was unusual for this area because of a late spring freeze.

The Mormon Lake burnout squad and line building squad could not see fire buildup below them in the draw.

The fire buildup was observed by many people on the fire including the fire boss, line boss, adjacent sector boss, scout and aircraft crews. Its potential rate of spread was underestimated by them.

Topography did not prevent crew movement.

A steep draw on a southwest exposure and readily available fuels provided the conditions for rapid upslope fire movement.

C. Human Factors

Crew

The Mormon Lake crew was in good condition, well-disciplined, and morale was high. They were observed to be a highly productive crew the day before.

Crew was specifically selected by fire boss for this assignment because of apparent expertise and previous day's performance.

Crew boss and squad bosses were serving in those positions for the first year, but had worked together on 17 fires this year.

The crew boss, with the sector boss and line boss, had taken an aerial reconnaissance flight prior to beginning burnout.

During burnout, crew boss and squad boss were serving as working members of the four-man burnout squad. No lookout was posted by the squad.

The line-building portion of the crew was ordered to evacuate by the crew boss. He asked for and received confirmation that they had reached the preplanned safety area.

Burnout squad did try to go to the same preplanned safety area but the fire had crossed their planned route.

Burnout squad then attempted to reach their preselected safety area, but were blocked by the fire.

Better alternate escape routes over the ridge away from the fire were available.

Burnout squad remained together, communicated their situation to the sector boss, and took survival precautions at direction of crew boss with no evidence of panic.

The four-man burnout squad remained together when overrun by the fire.

Sometime during or immediately after the fire passed over them, two men of the burnout squad left their refuge site and ultimately perished.

The remaining two men of the burnout squad stayed in place. The survivor stated that he remained prone while the fire passed over.

Overhead

New interagency fire suppression qualification standards have been established recently.

The new standards have been adopted nationally by the Forest Service and are being pilot tested by the BLM in Montana and New Mexico.

Standards applicable to this fire were the existing USDI standards, dated April 23, 1973.

Some members of the fire management team did not meet existing USDI standards.

Had the new interagency standards been applicable some team members would not have been qualified for the jobs to which they were assigned.

The following positions were not filled on this fire:

> Tractor boss, fire behavior officer, equipment officer, communication officer, air attack boss, and others.

Sector boss and line boss relied heavily on Mormon Lake and Happy Jack crew boss judgment to complete the crews' assignments.

The fire boss issued a strong and direct order to get out of the area just prior to the fire's uphill run to an individual in an adjacent area. This order was interpreted by the adjacent sector boss who was observing the situation as being directed to the Mormon Lake crew's sector boss. Because of this he did not issue a warning to evacuate that he was about to give to the Mormon Lake crew's sector boss.

The crew boss was given specific instructions by the sector boss to move the line-building squad to the safety area.

The sector boss observed what he thought was the burnout squad moving out to the heliport, adjacent to the safety area. He issued no specific instructions to move the burnout squad to safety.

D. Management Factors

Fire team had not worked together previously and were not a pre-organized project fire team.

The interagency nature of the fire management team was not a problem.

The plans and service organization was assembled at fire camp approximately 24 hours prior to the accident.

There was an absence of key support positions in the plans and service function which resulted in members of team doing other duties which detracted from their primary assignment.

A central point of ordering and followup at the fire was not established.

Work assignments and instructions were verbally communicated to crew boss by fire boss, line boss, and sector boss.

Maps and written instructions were not used in briefings or distributed.

Mormon Lake crew did not get to line until approximately 1030 due to planned helicopter not arriving when anticipated.

Weather intelligence was not formally and regularly gathered on the fire. Spot forecasts were not made until Sunday.

Previous day's fire behavior should have alerted the fire organization as to the probable fire behavior and served as a background and clue to alternative escape routes, suppression action, etc.

There was no aerial reconnaissance by the fire team between 1100 and 1500, July 17, 1976.

There was no intelligence requested nor given from aircraft over the fire, although aircraft were present most of the time.

The July 17 burnout operations of Happy Jack and Mormon Lake crews were not tightly coordinated and controlled in the plans for the day or during execution by the line boss and fire boss.

Burnout at bottom of draw moved slowly at first but accelerated up the steep slope and cut off the Mormon Lake squad and then overran them.

Various overhead were aware of the position of the burnout squad's activity, but the individual crews were not aware of each others position or activity.

No formal lookout with communications was posted for the burnout squad.

Rescue effort was prompt and professional and effective.

This accident was not caused by any single factor, rather by several contributing factors. There is no evidence of individual misconduct.

APPENDIX

C O P Y

Memorandum

To: BLM D-BIFC July 28, 1976

From: Director

Subject: Investigation and Report of Battlement Creek Fire Fatalities and Injuries

You are hereby designated as the Bureau's representative and co-chairman of a factfinding team charged with determining the conditions and circumstances that led to the recent fatalities and injuries on the Battlement Creek Fire near Grand Valley, Colorado. Concurrently with your assignment, Mr. R. Max Peterson, U.S. Forest Service, is being designated as the other co-chairman.

Once the factfinding team has completed its study and appraisal, both co-chairmen are to forward duplicate detailed reports of findings and recommendations to their respective headquarters offices (Director, BLM, and Chief, U.S. Forest Service) by August 10, 1975. Since release of these reports will be made solely and jointly by the headquarters offices, no other releases of your report are authorized at this time.

/s/ George L. Turcott

GEORGE L. TURCOTT
Associate Director

cc:
Director, Fire Management, USFS
State Director, Colorado

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

WO

C O P Y

REPLY TO: 6730 Accident Investigation July 30, 1976

SUBJECT: Investigation and Report of Battlement Creek Fire Fatalities and Injuries

TO: R. Max Peterson
Deputy Chief

You are hereby designated as the Agency's representative and co-chairman of a factfinding team charged with determining the conditions and circumstances that led to the recent fatalities and injuries on the Battlement Creek Fire near Grand Valley, Colorado. Concurrently with your assignment, Mr. Jack Wilson, Bureau of Land Management, is being designated as the other co-chairman.

Once the factfinding team has completed its study and appraisal, both co-chairmen are to forward duplicate detailed reports of findings and recommendations to their respective headquarters offices (Chief, Forest Service, and Director, BLM) by August 10, 1976. Since release of these reports will be made solely and jointly by the headquarters offices, no other releases of your report are authorized at this time.

/s/ John R. McGuire

JOHN R. McGUIRE
Chief

cc:
Director, Fire Management
Director, BLM

PLANS FOR BATTLEMENT CREEK FIRE

Friday, July 16, 1976, Night Shift

Saturday, July 17, 1976, Day Shift

Haslem--F.B.
Bartlett--D.C. Maps and Records:
Engle, Dave--S.C.

BATTELEMENT CREEK FIRE

Fire #1173

Friday - July 16, 1976

Evening Shift:

Line Boss---Rick Vincent

Division A.

Sector #1 2 Sector Bosses

Sector Boss Green

Carson Hotshots	(Road)
Santa Fe Hotshots	
Pan Ams	

Sector Boss Sexton

S R V	#70	(Cat Line)
"	# 2	
"	#39	
"	#30	(Bob Clark)

These crews will leave fire camp at 1900 hrs. and will be bussed to the bottom of Div. I. Tools will consist of ½ shovels and ½ pulaskis. In addition each crew will be equipped with 1 chain saw and 1 radio per crew.

Division B.

Sector #1

This crew will leave camp at 1900 and be transported to the T. V. antenna site area where they will walk into the area immediately east of the ridgetop. The crew will be equipped with 1 chain saw and 1 radio.

All overhead will have a radio. Crew members will be reminded of safety precautions related to working in steep terrain at night, keep men spaced out, watch for rolling rocks, etc.

BATTLEMENT CREEK FIRE

FIRE # 1173

SATURDAY, JULY 17, 1976

Dayshift:

Fire Boss----------Jack Haslem
Line Boss----------Walt Smith
Plans Chief----------Bill Bartlett
Service Chief----------Dave Engle
Safety Officer----------Jon Bellar

Sector #1

Sector Boss----------Putnam
Sawtooth IR Crew:

Crew will construct handline from road and tie in black on northwest corner. Bulldozers will be used where possible.

Sector #2

Sector Boss----------Sexton
Happy Jack Hotshots and Grand Junction E.F.F.

These crews will mop up along Cat Line and road. Unburned areas will be burned out upon command.

Sector #3

Sector Boss----------Coleman
Mormon Lake Crew

This crew will be helicoptered to the top and will burn out along line in order to strengthen line. Crew will move into black area when unburned draw is fired from below.

UNITED STATES
DEPARTMENT OF THE INTERIOR

INDIVIDUAL FIRE REPORT

1. REPORT STATUS *(check one)* (2): [X] NEW [ ] CORRECT [ ] DELETE

5. Reporting Agency *(circle one)* (13): [1] BLM [2] BIA [3] NPS [4] BSF&W [5] OTHER

2. Calendar Year (3-4)	3. Fire No. (5-8)	4. Reporting Unit (9-12)
76	1173	C007

6. Area Name (14-17): 88

7. Fire Name (18-27): Battlement Creek

8. TYPE

a. Fire (28)	b. Protection (29)
1	1

11. LOCATION OF FIRE ORIGIN *(Location plat on reverse of original)* (38-57)

a. Coordinates (30-38): Lat. 39-27, Long. 107-58

b. Rectangular Survey (39-52): T. 7S, R. 95W, Sec. 11, 06 Mer.

9. CLASS

a. Size (53)	b. Cost (1) Code (54) (2) Actual $
5	–

10. PLANNING DATA

a. Cause (55-57): 101	b. Class of people (58): 0
c. Ownership (59): 8 & 1	d. Resource value class (60): 3
e. Topography (61): 8	f. Hour control zone (62): 3
g. Rate of spread (63): 2	h. Resistance to control (64): 3
i. Fire danger indices (65-70): 94	j. Fuel model (71-74): C2

12. SUPPRESSION DATA

	DATE	TIME	TYPE	AMT	ACRES
a. Discovered (9-23)	0715	1510	1		2
b. Reported to Agency (24-31)	0715	1510			
c. First crew/ equipment departure (32-41)	0715	1525	3	1	
d. First attack (42-57)	0715	1620	3	1	100
e. Controlled (58-71)	0720	0700			880
f. Declared out (72-75)	0722		g. Total force (76-79)		300

13. BURNED AREA DATA / **14. RESOURCE DAMAGE** *(Dollars)*

STATE (9-10) (a)	COUNTY, PARISH, OR BOROUGH (11-13) (b)	OWNERSHIP (14) (c)	VEGETATIVE TYPE (15-17) (d)	RESOURCE VALUE CLASS (18) (e)	SEVERITY OF BURN (19) (f)	ACRES BURNED (20-26) (g)	SOIL (27-31) (a)	WATERSHED (32-37) (b)	LOCATION (38-42) (c)	TIMBER (43-48) (d)	RECREATION (49-53) (e)	WILDLIFE (54-58) (f)	GRAZING (59-63) (g)
CO	045	1	200	3	1	710	7100	7100	3550	28,400	7100	7100	3550
CO	045	8	200	3	1	170	1700	1700	850	6800	1700	1700	850
TOTALS													

Submitted by *(Signature)*: Ray A Johnson

Title: Fire Management Specialist

Date: 8/17/76

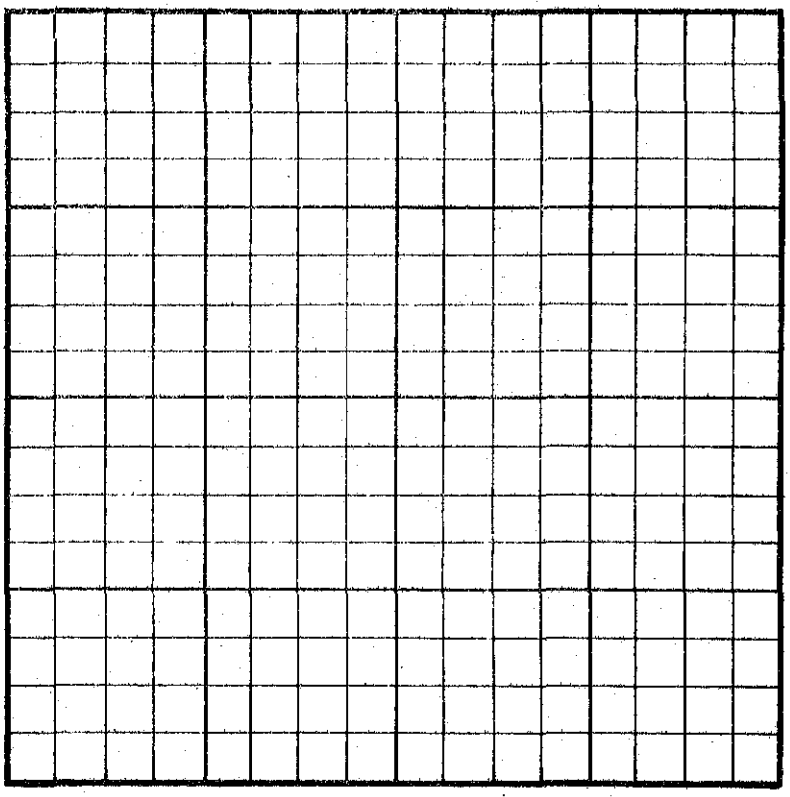
Approved by *(Signature)*: Copy

Title:

Date:

Form DI-1201 (February 1973) BLM – DISTRICT OFFICE NPS – AREA BIA – AGENCY BSF&W – REFUGE

LOCATION PLAT SCALE "=1 MILE



T. , R. , Sec. , Mer.

BRIEF OF EVENTS AND PRESS RELEASE PREPARED BY

INVESTIGATION TEAM

PRESS RELEASE
BUREAU OF LAND MANAGEMENT

Grand Junction, July 21, 1976

The following brief is the first reconstruction of the sequence of events leading to the death of 3 crew men and 1 injury at the 880-acre Battlement Creek fire. This fire on National Resource Land under Bureau of Land Management (BLM) jurisdiction was 5 miles west of Grand Valley, Colorado. All 4 men were members of the Mormon Lake Hotshots Crew assigned to the Coconino National Forest, Flagstaff, Arizona.

A 7-man team under the co-chairmanship of Jack Wilson, Chief, Boise Interagency Fire Center, (BLM), and Max Peterson, Deputy Chief, Forest Service, (FS), has been interviewing personnel who were in the area prior, during, or following the catastrophe and have also made an on-site review of the burned area and accident site.

The team is continuing to reconstruct events during the time of the tragedy and this is their most accurate assessment of the facts at this time.

BRIEF

On Saturday, July 17, at about 2:45 p.m., a 4-man burnout crew from the Mormon Lake Hotshot Crew, Coconino National Forest, (NF), whose planned route of escape was suddenly cut off by flames were overrun by the fire burning rapidly up a steep draw. Three men died at the scene, and one was evacuated by helicopter and is in fair condition in the Albuquerque Burn Center. The dead men were identified as:

Anthony "Tony" Czak, 25, 643 Campus Heights, Flagstaff, Arizona,

Scott L. Nelson, 22, 1505 5th Avenue, Bloomer, Wisconsin

Stephen H. Furey, 23, P.O. Box 1127, Salmon, Idaho.

The accident occurred on the Battlement Creek Fire which started from an undetermined cause 45 miles east of Grand Junction near Grand Valley, Colorado. The fire started on private lands and burned on to National Resource Lands managed by the Bureau of Land Management, (BLM).

Immediately following the accident, an Interagency Investigation team was convened and has been on the scene reconstructing the events which follow:

The Battlement Creek Fire was one of several fires in the area, and was first attacked with aerial retardant from planes based at Grand Junction. This was supplemented by Garfield County, BLM, and Forest Service crews and equipment. When these initial efforts failed to contain the fire, a fire team was assembled made up of BLM and USFS personnel. The team was headed by Jack Haslem, Grand Junction, Colorado, an experienced BLM Fire Boss. Additional crews and equipment were obtained, totaling approximately 300 men, aerial tankers, dozers, helicopters, and other equipment. One of the crews was the specially trained 20-man Mormon Lake Hotshots Crew from the Coconino NF at Flagstaff, Arizona.

The crew worked on the fire on Friday, July 16, burning out the critical southeast corner of the fire.

On Saturday, July 17, the crew was transported by helicopter to a rocky ridge to burn out a handline that had been constructed the

night before. The Crew Boss, Tony Czak, flew the area by helicopter with the Sector Boss prior to commencing work at approximately 11 a.m. The Crew Boss assigned fourteen members of the crew under the supervision of Squad Boss Don Kimball to widen the handline. He assigned John Gibson, the other Squad Boss and two crewmen to burn along the handline to provide a barrier to the main fire. Two members of the crew were stationed above the burnout crew on the rocky ridge.

The Crew Boss ordered Kimball and his portion of the crew out of the area and into a previously burned area while he and the burnout crew remained to complete the remaining distance of about 200 yards. They intended to follow Kimball and the balance of the crew as the burnout was to be completed in a few minutes.

A fast-moving finger of the fire moved up a steep slope, out of their view, and cut off their planned route of escape. Czak notified both his Sector Boss and Squad Boss that he was cut off and unable to follow the balance of his crew. The four men retreated up the ridge along the burned out line looking for a safe place. When it became apparent to them that the fire would overrun them, using survival techniques, they removed their cruiser vests, wet themselves down with water from their canteens, and laid face down on the ground in a depression along the fire line.

The heat and smoke was intense as the fire passed over them, and some of their clothing ignited. Crew Boss Czak and crewmen Nelson and Furey perished. John Gibson survived. Sector Boss Coleman, Glenwood Springs, Colorado, arrived approxiamtely ten minutes after the fire passed and found both Gibson and Furey alive. Steve Furey died

at the scene in spite of first aid, including mouth-to-mouth resuscitation by Coleman.

Immediately upon arrival at the scene, Coleman advised Fire Boss Haslem that there were injured men and help was needed.

A helicopter with an experienced medical technician and first aid equipment arrived at the scene within 10 minutes.

John Gibson was promptly removed to St. Mary's Hospital in Grand Junction, and later, after initial treatment was flown to the burn unit in Albuquerque.

The investigation will proceed in two directions:

1. To validate what happened;
2. To determine what factors caused the accident and what steps the agencies might take to prevent a recurrence in the future. It will require several more days to complete the fact-finding phase and write a report.

FOR THE PRESS:

Terms

Fire Boss - Overall direction of the fire fighting activities

Line Boss - Person responsible for all fire line construction

Sector Boss - Responsible to a Line Boss for a portion of the line. Supervises crew bosses.

Crew Boss - Person in charge of a crew on the fire. (Usually 20 men). Reports to Sector Boss.

Squad Boss - Person in charge of portion of the crew. Reports to Crew Boss.

Fire fighters still battle blaze

By TUPPER HULL
Sentinel staff writer

GRAND VALLEY – Fire fighters for the U.S. Bureau of Land Management (BLM) late Friday were banking on a 20-foot wide swath cut along a ridge thick with scrub oak to halt the advance of a raging brush fire near here which was burning out of control.

BLM fire boss Jack Haslem said at 7 p.m. Friday an estimated 700 acres of pinion pine, juniper and oak covered hills had been consumed by the fire.

Pilot killed

A veteran pilot for the BLM died in a fiery plane crash at about 9 a.m. Friday when the converted B-26 bomber he owned and was flying struck a high mountain cliff near the fire as the plane was beginning a sweep into the fire to dump a load of retardant. The pilot was identified as Donald Goodman, 58, of Missoula, Mont.

The blaze was still raging late Friday night in the Battlement Creek area about five miles southeast of Grand Valley.

As the fire intermittently cooled and then burst into explosive hot spots, two bulldozers worked through the day cutting the fire line on a ridge about half a mile south from the hottest part of the fire.

Full force

Fire boss Haslem said he planned to throw the full force of his 300 men directly onto the fire Friday night and early Saturday morning, taking advantage of the cool night weather.

Earlier in the day Friday, Haslem said a 10 degree increase in temperature would threaten spreading the fire throughout the vast and heavily timbered Battlement Creek valley.

As temperatures rose during the day so did the fire's furry but yellow shirted "hot shot" crews from six western states were deployed along a narrow winding road way that separated the fire from untouched ground.

With their backs to the blaze, the crews watched intently for any sign the fire would jump the roadway and spread.

Haslem said the fire was hotter than most brush fires, due mostly to the dry and brittle oak bushes that cover the hillsides here. A frost in mid June, he said, killed much of the oak leaving it "completely dry."

Firefighting planes and a helicopter dropped thousands of gallons of bright red fire retardants and water on the fire all day Friday.

Warm temperatures

Forecasts for the Grand Valley area called for continued warm temperatures with the possibility of late afternoon thunderstorms.

"I wish like hell I'd hear a weatherman say there's going to be six inches of rain up here tonight," Haslem said.

Haslem said because the fire was so capricious he had not placed any of his men working directly on the fire for fear they would be trapped in one of the many valleys in the area should the blaze suddenly accelerate. "It's just a waiting game now," he said.

The fire is the largest fire in Colorado this year.

Haslem said the blaze was probably started by lightning several days ago. Lightning strikes, he said, will often smoulder for several days before turning into actual fires.

Aerial view reveals destruction

An aerial view of the forest fire at Battlement Creek, five miles southeast of Grand Valley, gives dramatic impact to the destructive force of fire.

From its origin on the north side of Morissania Mesa, the blaze crested the peak and swept to the south side of the mountain.

The fire has burned a swath from the base of the mesa to the top at least one-half mile wide. All that is visible now on the north side, of what was once a forest of juniper and pine is a gray and black landscape. The gray was brush. The black, trees.

There is no immediate threat to any of the homes in the Grand Valley area.

The blazes Friday afternoon were raging on the south side, and white smoke attempted to crowd scattered clouds out of the sky.

Above the fire, flying into the smoke and possible updrafts caused by the tremendous heat generated by the flames, are helicopters carrying water or smoke jumpers. They fly into the smoke, and emerge periodically appearing to almost touch the tops of the trees.

Two miles further south from the scene of the fire, on a barren bluff is the charred wreckage of a B-26 bomber which was dropping fire retardant on the fire. That crash claimed the life of Don Goodman, a pilot from Missoula, Mont., at 9 a.m. Friday.

Sat., July 17, 1976, Denver, Colo. Rocky Mountain News

Flier fighting forest fire killed in Western Slope crash

By JONATHAN DEDMON
News Staff

A 58-year-old Montana man was killed Friday fighting a forest fire on the Western Slope when his plane crashed while dropping fire retardant chemicals.

The fire, which had consumed more than 600 acres in the Battlement Creek area east of Grand Valley, was reported out of control late Friday and was being battled by more than 250 fire fighters.

A spokesman for the U.S. Bureau of Land Management (BLM) identified the dead man as Don Goodman of Missoula.

Goodman's plane, a converted B-26 bomber, was one of three dropping fire retardant chemicals on the blaze when it crashed about 9 a.m., according to Stuart Cox, a dispatcher with BLM's Branch of Fire Control in Grand Junction. Goodman was the only person aboard.

"We don't know why the plane went down," Cox said. "An investigative team went into the crash site today, but it will be some time before we know anything definite."

Goodman's body was recovered and taken to Rifle.

The fire is believed to have been started by lightning several days ago and to have smoldered until breaking into flames Thursday.

The flames were spotted about 2 p.m. about five miles east of Grand Valley in an area wooded with pinons and junipers.

Cox said several orchards in the area had been threatened but fire fighters have been able to prevent any damage.

One television microwave tower did suffer some damage from the blaze, however.

Cox said fire fighters were being hampered by winds of 10 to 15 miles per hour and that thunderheads were building late Friday which could cause further problems.

"The thunderheads make the wind more erratic, and there could be more lightning," Cox said.

Fire fighters were flown in from a half dozen western states.

Another smaller fire 12 miles east of Grand Junction was reported under control late Friday. That fire consumed about 20 acres, and Cox said about 20 persons would continue fighting it through the night.

★THE DENVER POST Fri., July 16, 1976

300 Working to Contain Two Forest Fires

GRAND JUNCTION, Colo.—Almost 300 men were working Friday to control two fires in pinon-pine and juniper country near here.

One blaze about five miles east of Grand Valley and south of Interstate 70 had burned about 500 acres. The other, 12 miles east of here, burned about 10 acres.

Stuart Cox, fire dispatcher in the Bureau of Land Management (BLM) office here, said three airplanes are being used to drop fire-retardant chemicals on the blazes. He said fire fighters made no estimates when either fire would be controlled.

The fire near Grand Valley is mostly on BLM land but has involved some private acreage. The other blaze is confined to BLM land. Both are thought to have been caused by lightning.

Cox said erratic winds have hampered the fire-fighting efforts. The fire near here, he said, is in such rugged country that men must be ferried in by helicopter.

Sun., July 18, 1976, Denver, Colo. Rocky Mountain News

Grand Valley forest fire kills three

Three fire fighters were killed and a fourth was seriously burned Saturday when a Western Slope forest fire exploded as they and others tried in vain to bring it under control.

The fire, east of Grand Valley, has now consumed 1,000 acres of wooded land and has claimed four lives. The first victim was the pilot of a slurry bomber which crashed Friday.

The dead men were identified only as Steve Furey, Tony Czak and Scott Nelson. The injured man was identified as John Gibson, 27, of Wellesville, N.Y. He was listed in serious condition in the intensive care unit of St. Mary's Hospital in Grand Junction.

A hospital spokesman said Gibson had suffered second- and third-degree burns over 25 per cent of his body.

Stewart Cox, public information officer for the U.S. Bureau of Land Management, reported that a section of the blaze had blown up, causing an emergency and requiring that medical care be called for.

Confirmation of the deaths came from Garfield County Coroner Orval L. Sowder, who said the victims were professional fire fighters employed by the U.S. Forest Service.

There are 280 persons fighting the fire.

Cox said the blaze burned an additional 200 acres Saturday and was still out of control at the end of the day. He said it was impossible to predict when it might be controlled.

Two slurry bombers resumed efforts to slow the fire by dropping retardant chemicals on it. Cox said the two planes made repeated flights Saturday.

Such flights had been temporarily halted after Friday's fatal crash.

The fire is burning in pinon pine and juniper trees about five miles est of Grand Valley and south of Interstate 70. The acreage consumed so far includes at least 170 acres of private property.

"It is still burning out of control and moving in a northerly direction," Cox said. He said hot weather and "high and erratic winds" were the chief factors hampering firefighting efforts.

**THE DENVER POST Sun., July 18, 1976

780 Forest Acres Continue Burning Near Grand Valley

GRAND JUNCTION, Colo. — Almost 300 fire fighters aided by two slurry bombers still were struggling Saturday noon to gain control of a 780-acre forest fire 55 miles northeast of here.

The fire is burning in pinon pine and juniper trees on a mountainside five miles east of Grand Valley and south of Interstate 70.

IT COST THE LIFE Friday morning of Don Goodman, 51, Missoula, Mont., who was killed when his converted B26 bomber smashed into the mountain on a slurry run. Goodman, a veteran flier, owner the plane and had made two runs on the fire the previous day. The cause of the crash is being investigated.

Friday night, fire fighters expressed hope they could control the blaze Saturday. But Stuart Cox, fire dispatcher in the Bureau of Land Management (BLM) Grand Junction office, said Saturday that no fire official would make a guess when the flames would be in hand.

Temperatures have been running in the high 90s, humidity at less than 20 per cent and the wind erratic in the rugged terrain at 10 to 15 miles per hour. "It's pretty good fire weather," Cox said.

THE FIRE WAS DISCOVERED Thursday afternoon and the first guess on its cause was lightning, but that also is being investigated, Cox said.

Of the acreage involved, about 170 acres are privately owned and the rest is BLM land. Cox said power lines and a television microwave tower are the only man-made structures that have been damaged.

A fire in similar terrain — all on BLM land — 12 miles east of Grand Junction was controlled Friday after burning about 20 acres.

Forest fire fatal to 4 finally contained

By DOUGLAS KREUTZ
News Staff

GRAND VALLEY — A forest fire which claimed four lives and blackened 940 acres in the rugged western Colorado mountain country near here was contained by 300 fire fighters late Sunday.

Officials of the U.S. Bureau of Land Management (BLM) and Forest Service said they hoped to bring the fire under control by Monday morning.

Meanwhile, BLM officials said it wasn't known why three of the four men killed in the blaze failed to evacuate an area believed about to "blow up" — a fire fighters' term for a quick and intense fire.

ON SATURDAY, three Forest Service fire fighters were killed and a fourth was severely burned when they were trapped by flame on the side of a canyon wall.

"We knew there was a natural chute up there, and we knew it was going to blow," BLM information officer Roy Johnson said from the scene Sunday as a cold rain doused the remains of the fire.

"Members of the (20-man) crew in the area were warned to move out. Most of them regrouped in a safe area. It's not clear what the others were doing or why they weren't there."

The dead men were identified as Steve Furey, 23, of Salmon, Idaho, Tony Czak, 25, of Phoenix, Ariz., and Scott Nelson, 25, of Bloomer, Wis.

The injured man — John Gibson, 27, of Wellesville, N.Y. — was listed in fair and stable condition Sunday at a hospital for burn victims in Albuquerque, N.M.

The other fire fatality was Donald Goodman, 58, of Missoula, Mont., who died Friday when the modified B-26 slurry plane he was piloting crashed near a ridge during a flight to drop retardant chemicals on the fire.

As fire fighters conducted mop-up operations Sunday afternoon, most appeared somber about the deaths of their fellows. None was able to supply details of how the accidents occurred.

OTHER MEMBERS of the crew to which the victims belonged were evacuated from the fire line and not available for comment.

The blaze, which began Thursday on private land, may have been man-caused, Johnson said.

He said the 300 BLM and Forest Service fire fighters came from several states to battle the fire, which consumed pinon pine, juniper, oak brush and grasses. Four slurry bombers and several helicopters were used in containing the blaze, which burned out of control until Sunday.

Johnson said a team of investigators from the Boise Inter-agency Fire Center were trying to determine how the men were caught in the blow-up and why the pilot crashed.

It isn't known how long the investigation will take, he said.

"It's tough to tell what happened," Johnson said. "The blow-up was expected and the men were warned. That's all we know for now."

Johnson pointed out that morning winds customarily blow uphill in mountain canyons, then reverse themselves later in the day.

Saturday's blow-up, he explained, came in a 160-acre area in a steep canyon. He said trees there had been dried and heated by the morning winds. When the wind shifted in the afternoon, and flames reached the timber, it ignited with explosive speed.

"To see one of these things is like seeing gasoline explode," he said.

HE SAID the deaths were not the worst catastrophe in forest fire-fighting history, but that it was one of the worst in Colorado. (He cited a California fire in which nine fire fighters were killed.)

News clips show the last forest fire-related death in Colorado occurred in 1964 when a man was struck by the tail rotor of a helicopter while fighting a blaze near Eagle.

The top four fire officers — fire boss, plans chief, service chief and line boss — were relieved from duty Sunday when the investigation began, Joneon said.

Johnson said relieving the officers was a routine procedure and didn't indicate that any of them had been negligent in their duties.

Jack Haslem, who was serving as fire boss when the deaths occurred, was replaced by Clair Baldwin.

Goodman's was one of three planes dropping "slurry" on the fire. The slurry bombing operations were halted Friday after the crash and weren't resumed until Saturday.

Pat Archer, a BLM information officer, said slurry bombing was again halted at noon on Sunday to allow fire fighters to bulldoze and axe their way around the troublesome southeast corner of the fire.

"The rain fell right on the area that needed it," she said Sunday. "Everything has been going in our favor today."

SINCE THE FIRE was first spotted in the Battlement Creek area Thursday afternoon, hot, dry weather and erratic winds have hampered control efforts.

"It's a very difficult area to get into because it is very steep and hilly," Ms. Archer said. "It's very hard for the ground crews to work and the pilots to navigate. The bulldozers are also having trouble and the fire line is being cut mostly by hand as a result."

Much of the fire-fighting effort has been directed from a helicopter over the area.

Of the forestland burned, about 170 acres is private property. The rest is national resource lands managed by BLM.

Fire Contained After Claiming 4

GRAND VALLEY, Colo. — A forest fire that has claimed four lives and burned about 880 acres was contained about 6 p.m. Sunday as nearly 300 fire fighters established a fire line to prevent further expansion.

It is expected that all of the hot spots will be "knocked out" and that the fire will be controlled by 8 p.m. Monday, Lloyd Johnson, a spokesman for the Bureau of Land Management (BLM), said Monday morning.

A heavy rain Sunday night "cooled down the fire considerably," and the humidity in the fire area was up Monday, Johnson said. The fire is in the Battlement Creek area, about five miles east of Grand Valley and 45 miles northeast of Grand Junction, Colo.

THE FIRE STARTED Thursday and damaged a microwave station while raging out of control for nearly four days.

The victims of the fire, officials said, include three fire fighters who apparently ignored a warning to evacuate a dangerous area and the pilot of a slurry bomber.

The pilot was identified as Donald Goodman, 58, Missoula, Mont., who was killed when his plane crashed Friday while flying outside the fire line with a load of fire retardant. The plane crash also created a one-acre fire, Pat Archer, BLM public information specialist in Grand Junction, said.

Four fire fighters from the Coconino National Forest in Arizona were caught Saturday in a draw when the fire overtook them from behind, Mrs. Archer said. The three men who died were identified by Mrs. Archer as Steve Furey, 23, Salmon, Idaho; Tony Czak, 25, Phoenix, Ariz., and Scott Nelson, 25, Bloomer, Wis.

THE FOURTH MAN, John Gibson, Wellsville, N.Y., was critically injured and was flown Sunday to the University of New Mexico Medical Center in Albuquerque for treatment of burns he suffered over about 25 per cent of his body.

The four men, Johnson said, were members of a crew that was warned to move out of the dangerous area. Most of the crew went to a safe area, but it's not clear why the four men remained in the dangerous area. The three deaths still are being investigated, Johnson said.

About 297 firefighters still were at the fire scene Monday morning, Johnson said. BLM officials, he noted, first thought that the fire was lightning-caused. But the cause still is being investigated, he said.

The fire is in an area of oak brush and juniper forests in mountainous terrain at an altitude of about 7,000 feet, Johnson said.

-The Daily Sentinel, Grand Junction, Colorado Monday, July 19, 1976

Cooler weather aids efforts to contain fire

By DON FREDERICK
Sentinel staff writer

GRAND VALLEY – One of the deadliest United States forest fires in years appeared to be coming to an end this morning in the Battlement Creek area about five miles southeast of here.

Cooler temperatures and heavy rainfalls Sunday afternoon and night helped fire fighters contain the blaze after it had raged out of control since Thursday.

Officials with the U.S. Bureau of Land Management (BLM) anticipated the fire could be declared "controlled" later today, according to BLM spokeswoman Pat Archer. The BLM supervises the public land on which most of the blaze, believed caused by lightning, occurred.

Mop-up duties

According to Mrs. Archer, the fire originally broke out on private land sometime Wednesday night or early Thursday morning.

This morning, fire-fighting crews which were flown into Grand Junction and transported to the fire from a number of Western states, were engaged in "mop-up" duties – cooling down the remaining smoking spots in the fire area.

The fire claimed the lives of four fire fighters and destroyed an estimated 380 acres of mostly scrub oak, pinion pine and juniper.

The first fatality occurred Friday morning when a converted B-26 bomber spreading fire retardant on the blaze crashed on a mountainside. Killed was pilot Donald Goodman, 58, of Missoula, Mont.

Saturday afternoon, sometime between 2 and 3 p.m., four fire fighters stationed with the Coconino National Forest in Flagstaff, Ariz., were trapped when flames suddenly raced through unburned scrub oak on a mountain slope.

Killed were Tony Czak, 25, of Phoenix, Ariz., Steve Furey, 23, of Salmon, Idaho, and Scott Nelson, 22, of Bloomer, Wis.

Garfield County Coroner Orville Sowder said the three died of suffociation as oxygen was sucked from the flames that engulfed them. Rescuers reported the bodies also were badly burned.

Seriously burned in the accident was John Gibson, 27, of Wellsville, N.Y. After first being treated at St. Mary's Hospital in Grand Junction, Gibson was transferred Sunday morning to the University of New Mexico Medical Center in Albuquerque, which has special facilities for burn victims.

Fair condition

This morning, Gibson was reported in fair condition at the hospital, suffering from second-degree burns on 25 per cent of his body.

Also reported damaged was a microwave relay station in the Battlement Creek area. Homes located less than a mile from where the blaze is believed to have started sometime Wednesday night were never threatened since the fire spread up towards the overlooking ridges.

Although the acreage burned in the Battlement Creek blaze was small compared other major U.S. forest fires, the human toll made it one of the worst in the memory of veteran fire fighters.

Jack Wilson, director of the Boise (Idaho) Interagency Fire Center which coordinated the efforts to fight the Battlement Creek blaze, could today remember only a few other U.S. fires in the 1970s that resulted in multiple deaths.

Arnold Hartigan, public affairs director for the Boise Interagency Fire Center, called the Battlement Creek blaze "the deadliest in a long time." He said the type of accident that claimed the three fire fighters from Arizona "doesn't happen very often."

Investigation team

Federal officials from a variety of U.S. government agencies have formed an investigative team and began looking into the accident Sunday. Wilson of the Boise Interagency Fire Center said the team included himself and experts in weather, safety and fire behavior. Wilson said the investigation would continue throughout this week.

Jack Haslem, who works with the Grand Junction BLM office and served as "fire boss" for the Battlement Creek blaze, said the three Arizona fire fighters perished during a "blow out" that occurred Saturday afternoon.

Haslen said fire fighters fear "blow outs" during the afternoon hours of a forest fire when a combination of high temperatures at ground level and winds can cause a blaze to literally "explode" into an area of unburned fuel.

Haslem said the Arizona crew of firefighters was working Saturday afternoon above such an area of unburned scrub oak when the blow out occurred and four of the crew members became trapped. Haslem said that in this case the fire spread over about three-eights of a mile of scrub oak in about 30 minutes.

The tragedy, plus a light thundershower that passed over the Battlement Creek area Saturday evening caused Haslem to remove fire fighters from the mountainous terrain that night. He said the fire fighting crews, which numbered almost 300 persons, "were a little nervous."

Perimeter line

Sunday, the crews returned to their fire fighting chores, finishing construction of a perimeter line around the blaze and spreading dirt over remaining "hot spots." Helicopters also continued dumping water over smoking spots in the fire area.

Officials for the BLM report that already this year their Grand Junction office has responded to 101 fires in the area compared to 33 for the same period in 1975.

Killer Fire Believed Contained

SYRACUSE POST-STANDARD, July 19, 197

GRAND VALLEY, Colo. (AP) — A forest fire which has claimed four lives and has raged unchecked through mountain woods since Thursday was believed contained on Sunday night.

A spokeswoman for the Bureau of Land Management, Patricia Archer, said fire crews were expected to control the blaze on Monday. She set the size of the fire, originally estimated to have blackened 1,000 acres of heavily forested land, at 880 acres.

Mrs. Archer said crews setting up a fire line around the blaze were aided by sporadic rains, falling temperatures and fading winds.

"We had a favorable day," Mrs. Archer said. "It would take some pretty erratic weather for it to get away from us this time."

On Saturday, fire officials thought they had the blaze contained, but gusty winds fanned the flames out of control, she said.

Up to 265 firefighters have joined to effort to halt the fire, which may have been caused by lightning.

Three U.S. Forest Service employes from the Coconino National Forest near Flagstaff, Ariz., were killed in the fire Saturday, and a fourth fire fighter was critically burned.

The fourth fatality was a pilot whose plane crashed while he was dropping a fire retardant on the flames.

Mrs. Archer said the deaths of the Forest Service employes were under investigation. Garfield County Coroner Orval Sowder said the three suffocated.

THE DENVER POST Tues., July 20, 1976

Forest Fire Fighter Says He Got No Blowup Signal

GRAND VALLEY, Colo. —(AP)— A U.S. Forest Service employe who was severely burned while fighting a raging forest fire near here said Monday he received no warning that the blaze might blow up on him and three others.

"I had a radio and another man in the group had a radio, but I heard no warning," John Gibson, 27, said in a telephone interview from an Albuquerque, N.M., hospital where he was being treated for burns over 25 per cent of his body.

GIBSON, of Wellsville, N.Y., was transferred from Grand Junction to Albuquerque on Sunday.

"We all got down on the ground and used the survival methods we'd been taught," Gibson said. "I was lying right next to the others when the flames passed over us. I was praying awfully damn fast."

The 830-acre fire was brought under control Monday. Some of the 297 firefighters were being sent home Tuesday.

Earlier, the U.S. Bureau of Land Management said fire fighters were warned by radio to move out of the danger area before the three men were killed and Gibson injured. Officials said the three suffocated as the wind-driven inferno swept over them.

HOWEVER, Jack Wilson, chief of a team conducting an investigation to determine how the men died, declined to comment on whether a warning had been issued pending completion of the probe.

A veteran pilot also was killed in the fire. His plane crashed Friday while dropping a load of retardant on the blaze.

At forest fire site

—The Daily Sentinel, Grand Junction, Colorado Tuesday, July 20, 1976

BLM begins reclamation work

By DON FREDERICK
Sentinel staff writer

GRAND VALLEY – The U.S. Bureau of Land Management (BLM) has begun efforts to rehabilitate and eventually revegetate almost 900 acres of land destroyed in a forest fire about five miles southeast of here.

Meanwhile, various federal officials today were continuing investigations into the cause of the blaze, which is believed to have started sometime Wednesday on private property, and an accident in which three fire fighters died after being caught in burning brush.

The fire, which occupied about 300 fire fighters from throughout the West, was declared "controlled" by BLM officials Monday. The fire had burned out of control until Sunday when heavy rainfall in the Grand Valley area gave fire fighters the chance to contain it.

About 140 fire fighters left from Grand Junction Monday night for their homes and about 80 more were to leave today, according to BLM spokeswoman Pat Archer.

Close up camp

The remaining fire fighters have begun to close up the camp erected last week about a mile from the fire area and aid in the initial reclamation being performed on the destroyed land, Mrs. Archer said.

Stewart Wheeler, a BLM manager in whose area the fire occurred, said a team was formed this morning to oversee the reclamation project.

Wheeler said bulldozers have already started "water barring" some of the land to divert the flow of water and reduce erosion.

The BLM eventually hopes to reseed the estimated 880 acres of scrub oak, pinion pine, juniper and various grasses destroyed by the fire, Wheeler said. About 710 acres of this land is under BLM supervision and had been used for cattle grazing, Wheeler said. The remaining 170 acres burned by the fire is privately owned.

Officials for a number of federal agencies, including the Boise (Idaho) Interagency Fire Center, the National Weather Service and the BLM, were meeting in Grand Junction this morning as part of an investigation into the deaths Saturday of three young men from a fire fighting crew stationed with the Coconino National Forest near Flagstaff, Ariz.

Trapped by flames

The three men – Steve Furey, 23, of Salmon, Idaho, Tony Czak, 25, of Phoenix, Ariz., and Scot Nelson, 22, of Bloomer, Wis. – perished when they were trapped by a sudden surge of flames up a canyon wall.

A fourth member of the crew, John Gibson, 27, of Wellsville, N.Y., suffered second-degree burns on 25 per cent of his body and was reported today in fair condition at the Burn and Trauma Unit of the University of New Mexico Medical Center in Albuquerque.

One aspect of the accident investigators are looking into is whether the four men had been warned to leave the canyon, which contained unburned foliage fire fighters had feared would suddenly burst into flames during the intense heat and high winds Saturday afternoon.

According to the Associated Press, Gibson told newsmen Monday that he and his three fellow fire fighters had not been told to leave the area or warned of the danger.

Gibson declined to accept a telephone call from The Sentinel today about this report. A nurse at the Albuquerque hospital said Gibson was receiving calls only from relatives.

The remaiming 16 members of the crew from the Coconino National Forest were removed from the fire scene and flown home immediately following the accident. Investigators say they have been interviewing these crew members this week.

A pilot from Missoula, Mont., who was flying a converted B-26 bomber spreading fire retardant on the blaze died when his plane crashed on a mountainside Friday. The four fatalities caused a federal fire fighting official to call the fire "the deadliest in a long time."

Refused to comment

Members of the federal investigative team have refused to comment about the details surrounding Saturday's accident until their investigation is complete.

The four top officials surpervising the fighting of the fire were replaced by a new team Sunday. However, Mrs. Archer of the BLM said such a change in command was "routine" and was not related to Saturday's accident. She said those supervising the fighting of a forest fire rarely get any rest and are "exhausted" after two or three days. The original command team for the Grand Valley area fire had arrived at the scene Thursday.

BLM officials originally believed the forest fire was caused by lightning which had caused a number of other miror fires in the Grand Valley area Wednesday.

Today, however, an investigative team was looking into the possibility the larger fire was man-caused.

Mrs. Archer said these suspicions were aroused because the fire began in a lower elevation than lightning usually strikes in the Valley area.

Mrs. Archer said today that though a portion of the acreage destroyed by the fire was privately owned, it is normal procedure for the BLM to rehabilitate all the land destroyed in a forest fire that involves federal property.

Various experts

Wheeler of the BLM said the reclamation team formed today includes experts in wildlife, water sheds and range conservation. He said he is hopeful reseding of the burned land can occur this fall. He also noted that not all the grass roots in the burned area may have been destroyed in the fire and so could revegetate naturally.

After examining the burned area this week, the BLM is to apply for federal funds for the reclamation projject, Wheeler said. Such a request must be approved by Congress. Wheeler could give no estimate of the possible cost of the reclamation project.

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FORECAST: Warm, cloudy Details, page 72

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96 PAGES

Survivor of forest fire reveals no warning given

By DOUGLAS KREUTZ
News Staff

The sole survivor of a forest fire blow up — a wind-driven inferno that killed three fire fighters near Grand Valley Saturday — said Monday he received no warning from fire observers that danger was imminent.

"I had a radio and another man in the group had a radio, but I heard no warning," said John Gibson, 27, in a telephone interview from an Albuquerque hospital where he is receiving treatment for burns over 25 per cent of his body.

"We all got down on the ground and used the survival methods we'd been taught," Gibson told the News. "I was lying right next to the others when the flames passed over us. I was praying awfully damn fast."

Bureau of Land Management (BLM) officials at the scene of the fire, which was declared under control early Monday, told the News earlier that fire fighters were warned by radio to move out of the danger area.

BLM information officer Roy Johnson said Sunday, "We knew there was a natural chute up there, and we knew it was going to blow. Members of the (20-man) crew in the area were warned to move out. Most of them regrouped in a safe area. It's not clear what the others were doing or why they weren't there."

But another BLM spokesman, information officer Pat Archer, said Monday officials hadn't been able to determine who had issued a warning — if, in fact, there was one.

Those killed were identified as Steve Furey, 23, of Salmon, Idaho; Tony Czak, 25, of Phoenix, Ariz. and Scott Nelson, 25, of Bloomer, Wis.

A fourth fire fatality was Donald Goodman, 58, of Missoula, Mont., who died Friday when the modified B-26 slurry plane he was piloting crashed during a flight to drop retardant chemicals on the fire.

A seven-member investigating team from the Boise Inter-agency Fire Center met in Grand Junction Monday to try to determine how the men died.

Jack Wilson, chief of the investigating team, said the other 16 members of the crew in which the deaths ocurred had been interviewed by investigators.

Wednesday, July 21, 1976 The Daily Sentinel, Grand Junction, Colorado-

'Finger of fire' blamed in death of three men

By DON FREDERICK
Sentinel staff writer

Three men fighting a forest fire near Grand Valley were killed Saturday after a "fast moving finger of the fire" which they did not see coming cut off their escape route, a preliminary investigation has determined.

Dale Andrus, director of the U.S. Bureau of Land Management in Colorado, released the findings of the investigation to The Sentinel late this morning.

Andrus said the investigation team set up to look into the details surrounding the fatal accident reported that the three men killed and a fourth injured had separated themselves from the rest of their crew when they were overtaken by the flames.

Conflict noted

Andrus added there are "conflicting statements" on whether the four had been warned by officials in charge of fighting the fire that they should not have been in the area where the accident occurred.

Andrus said the investigation would continue in hopes of clearing up this conflict.

The three men, fire fighters with the Coconino National Forest in Arizona, perished when they were trapped by a sudden surge of flames up a canyon wall. The fourth man was seriously burned. He is in fair condition at an Albuquerque hospital.

Investigators on hand

Andrus read for The Sentinel the report he has received from a special team of federal fire-fighting officials who since Saturday have been attempting to reconstruct the events leading to the fatalities.

The report went as follows:

The crew from Arizona first arrived at the forest fire scene Friday and spent the day fighting a "critical" portion of the fire, which broke out Wednesday about five miles southeast of Grand Valley.

On Saturday, the crew was ordered to a rocky ridge to work on a "hand line" that had been constructed around the perimeter of the fire.

Before the crew set to work, crew leader Tony Czak, 25, viewed the area by helicopter. Once on the ground, he ordered 14 members of the crew to widen the hand line. Three other crewmen were ordered by Czak to burn out the area in front of the hand line to provide an additional barrier to the fire.

Ordered to leave

About 2:45 p.m., Czak ordered the 14 members working on the hand line out of the area. Meanwhile, he and the other three crewmen tried to complete the burning of the area in front of the hand line.

Suddenly, "a fast moving finger of the fire moved up a steep slope out of their view and cut off their planned route of escape," according to the investigation team's report.

Czak notified other crew members by radio that he and his three companions were cut off. The four moved along the burned-out area hoping to escape the approaching flames. When it became apparent they would be overrun by the blaze, the four men doused themselves with water and lay down in a depression. The fire engulfed them and their clothes ignited.

Two already dead

About 10 minutes later a fire fighter from Glenwood Springs arrived on the scene. Czak and Scott Nelson, 22, were already dead. Steve Furey, 23, was still alive, but died within minutes despite first-aid efforts at the scene. John Gibson, 27, was seriously burned and was transferred to St. Mary's Hospital in Grand Junction. On Sunday he was flown to the Albuquerque hospital.

Andrus said the investigation will continue to further determine what happened, whether a warning had been issued and what factors caused the sudden flare-up of the fire.

Andrus had originally said he might not release all the details of the investigation team's report. He said Tuesday afternoon he was considering withholding portions of the report that might prove prejudicial to future court cases that may result from the accident.

Changes decision

But Wednesday morning Andrus said he decided to release all the information he has received so far.

Andrus said, "I assume law suits are going to be filed" concerning the accident and said he may withhold details from future reports by the investigation team.

The Grand Valley area forest fire, which destroyed about 880 acres of mostly oak brush grazing range, was declared officially controlled Monday. All out-of-state fire fighters left the scene Tuesday night. A crew of local fire fighters remained at the scene today conducting "mop-up" work, according to a Bureau of Land Management spokesmen.

Lightning believed cause of forest fire fatal to 4

Lightning apparently caused a fire that claimed the lives of four fire fighters and blackened 940 acres of forest land near Grand Valley in western Colorado.

A report given Wednesday to Dale Andrus, Colorado director of the Bureau of Land Management (BLM), by a seven-member investigative team from the Boise Inter-agency Fire Center said the team spent two days interviewing residents and made a thorough inspection of the point of origin of the fire and there is no evidence to indicate the fire was started by anything but lightning.

Earlier published reports indicated the fire may have been causes by carelessness at an outdoor party, but those reports were erroneous, according to a BLM spokesman.

"That report originated from an off-the-cuff remark made by a BLM official," the spokesman said.

When the final report is made, officials hope to see if anyone was at fault for not warning four men caught in a sudden surge of wind-blown fire that swept over them.

Three of the men, Steve Furey, 23, of Salmon, Idaho; Tony Czak, 25, of Phoenix, Ariz., the team leader, and Scott Nelson, 25, of Bloomer, Wis., were killed.

A fourth fire fighter, John Gibson, 27, of Wellsville, N.Y., is being treated in the University of New Mexico Medical Center in Albuquerque for burns on about 25 per cent of his body.

Last Friday, slurry bomber pilot Don Goodman, 58, of Missoula, Mont., was killed when his plane crashed during a slurry run.

THE DENVER POST
Wed., July 21, 1976 25

BLM Report On Forest Fire To 'Hide' Facts

GRAND JUNCTION, Colo.—(AP)—The director of the Bureau of Land Management (BLM) in Colorado said on Tuesday a report was being prepared on a forest fire which took four lives last week, but said many facts concerning the fire wouldn't be released.

Dale Andrus said those facts would be "held in an attorney-client relationship" to "safeguard the interests of the injured man and the families of the three crew members who were killed in the Battlement Creek fire."

The 880-acre fire near Grand Valley was brought under control Monday after burning for five days, and final operations were completed Tuesday afternoon.

An interagency seven-man team from the BLM and the U.S. Forest Service was investigating the deaths of three firefighters who suffocated when the fire blew up on them. A fourth man was severely burned in the incident.

In addition, a veteran pilot was killed when his plane crashed while dropping retardant on the blaze.

Earlier, the BLM said the four firefighters had been warned to move from the area before the fire got to them. But the injured man said he had received no radio warning.

Andrus said he expected to have results of the investigation by next week.

FOLLOWUP ACTION RELATING TO UNUSUAL FUEL CONDITIONS

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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AUG 16 1976

REPLY TO: 5100 Fire Management

SUBJECT: Extreme Fire Behavior Conditions

TO: Regional Foresters, Region 2, 3 and 4

The enclosed report and memorandum clearly explain an unusual fire behavior situation. The importance of this information became evident during investigation of the fatalities on the Battlement Creek Fire near Grand Junction, Colorado.

Please assure that line officers are aware of this potential problem. The information should also be shared with State Foresters in the affected areas. All fire teams assigned to fires must be cognizant of this unusual situation and not count on normal fire intensities and rates of spread.

While this matter relates particularly to frost dieback in Gambel's Oak, you should be alert for different conditions caused by other unusual events. Only through careful, thorough attention to the local situation can future problems be averted.

JOHN R. McGUIRE
Chief

Enclosure

cc: Regional Foresters, R-1 thru 10

August 6, 1976

EXTREME FIRE BEHAVIOR CONDITIONS NOW EXIST IN FROST-DAMAGED BRUSH FUELS

The purpose of this report is:

1. To alert wildland fire management agencies in Colorado and adjacent states regarding the current potential for extreme rates of fire spread in brush stands that suffered leaf mortality, due to a frost, on June 14, 1976, in Colorado.

2. To request that land managers thoroughly brief fire crews and overhead teams regarding any local fuel conditions that might accelerate rates of spread or increase fire intensities (should consider possible drought, insect, and disease effects in addition to frost-induced dieback).

3. To provide background information on the nature of fire behavior conditions in frost-damaged oak stands.

On July 15, Jack Wilson, BLM Director at BIFC, made a helicopter reconnaissance flight to evaluate frost-killed fuels on the west slope of Colorado in the Grand Junction area (see his attached July 16 memorandum to the State Director, BLM, Colorado). On June 14, the temperature at Grand Junction was 32°F., 28°F. at Rifle, and probably in the 24°F. range above 7,000 feet elevation. This frost caused widespread mortality to the leaves of Gambel's oak. Other species affected were snowberry, mountain mahogany, aspen, and Douglas-fir. As of late July, 50 percent or more of the Gambel's oak leaves in affected stands were dead and retained in the shrub crowns. Shed oak leaves contributed to a 1-2 inch litter layer on the ground.

The day of Wilson's flight, July 15, the stage was already being set to demonstrate a significant fire behavior episode in frost-damaged Gambel's oak. The Battlement Creek Fire, 40 miles northeast of Grand Junction, Colorado, made major runs on the afternoons of July 15, 16 and 17. On the afternoon of July 17, three members of an Inter-regional firefighting crew were overrun and killed by a fire that burned rapidly in frost-damaged Gambel's oak on a steep, west facing aspect. Slope percentages in the draw immediately below the crew ranged from 50 to 75 percent.

The single most significant weather event that affected the Battlement Creek Fire was extensive frost that occurred one month prior to the fire!

Fuel moisture sample on the Battlement Creek Fire were collected at 1830 on July 20 at 8800 feet on the ridge above the fire area:

Sample	Average Moisture Content (%)
Dead oak leaves (shrub canopy)	11.4
Leaf litter on ground	13.7
Dead oak branches (< ¼ inch)	12.4
Green oak leaves	166.5
Living oak stems (< ¼ inch)	193.8

The dead oak leaves in the shrub canopy could have been at 7-8 percent moisture content or less at the time of the fire run on Saturday, July 17.

The June frost significantly increased the amount of available fuel in the Battlement Creek area by contributing to the dieback of the oak leaves. One individual remarked that fire behavior conditions seemed 2-3 weeks early for this time of year.

Chemical analyses of the Gambel's oak leaves were conducted at the Northern Forest Fire Laboratory in Missoula:

	Green Leaves	Dead Leaves in Crown
Crude fat (%) [1]	1.60	.52
Total ash (%)	3.18	2.50
Low heat of combustion (Btu/lb)[1]	7886	7782

The crude fat content, or amount of volatile waxes, oils, and resins, was quite low in Gambel's oak. Much lower than the 8-12 percent reported for southern California chaparral. Therefore, the significant fire behavior fact was the great increase in amount of available fuel in the Gambel's oak crowns due to frost damage. Fuel chemistry did not play the important role on the west slope of Colorado that it does in California.

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[1] Samples were not frozen. Escape of volatiles might tend to make these values low.

Chaparral Model Nomograph Results

Site conditions on the Battlement Creek Fire on Saturday afternoon were run using the chaparral fuel model[1] of the National Fire-Danger Rating System with nomographs designed to predict fire spread, intensity, and flame length. Two different windspeeds (15 and 25 mph) and 2 slope percents (40 and 75) were used in the calculations. Dead fuel moisture was set at 5.5 percent and live fuel moisture at 150 percent.

Nomograph results:

Condition	#1	#2	#3
Windspeed (mph)	15	15	25
Slope (percent)	40	60	75
Effective wind (mph)	17	18	29
Reaction intensity (Btu/min/ft^2)	12,000	12,000	12,000
Rate of spread (ch/hr)	110	125	240
Flame length (ft)	20-30	20-30	30-40
Fireline intensity (Btu/sec/ft)	5500	6000	12,000
Time to go ½ mile (min)	24	21	11
Time to go 3/4 mile (min)	36	32	16.5

Conditions 1, 2, and 3 show the fire traveling ½ mile in 11 to 24 minutes. In reconstructing actual fire spread from photographs and observations, it appears that the fire traveled the last 1800 feet to the saddle in about 15 minutes. In terms of fireline intensity, 100 Btu/sec/ft of fireline is about at the upper limit for control by hand crews and 500 to 700 Btu/sec/ft for direct control of a fire by any forces. Fireline intensities for cases #1, #2, and #3 were 5500, 6000, and 12,000 Btu/sec/ft, respectively, or absolutely uncontrollable!

Fire Behavior Appraisal

A rather typical weather pattern, steep mountainous terrain, and frost-induced dieback in Gambel's oak established conditions for high rates of fire spread in the Battlement Creek drainage during afternoon hours. For these reasons there might be a tendency to equate the Battlement Creek Fire with a southern California brush fire, but such was not quite the case. Precipitation amounts were near normal for this time of year, humidities were not unusually low, and wind velocities generally fell far short of Santa Ana conditions. Green fuel moistures for oak leaves and stems were 166 percent and 194 percent, respectively, well above the 60 percent moisture contents recorded for drought-stressed chaparral in

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1/ Fire danger rating system fuel model B was selected because it came closest to representing brush conditions on the Battlement Creek Fire.

California. Nevertheless, dead oak leaves on the ground and in the crowns, abundant fine dead branches in the oak and mountain mahogany crowns, the dense arrangement of 6-12 foot shrubs, and slopes ranging from 50 to 75 percent provided all the potential necessary for a fast spreading, high intensity fire.

A prophetic report prepared by the Colorado State Forest Service[1] in 1974 described a "fuel type X" that supports high-to-severe wildfire hazards. (This report should be required reading for all fire management agencies in Colorado.) These primarily oakbrush fuels "are dense, high brush 1½ to 10 feet in height. Small scattered patches of conifer or deciduous trees or scattered individual trees may also exist but are of minor effect and occurrence. The fuels are continuous or nearly so. Despite heavy shading, the ground is seldom damp. Flammability may vary markedly in the year due to changes in fuel moisture and leaf fall. Fire seldom kills these species. Many resprout after fires with more stems resulting in more numerous, thin-stemmed fuels than before."

Burning characteristics are described as becoming "extra hazardous during special times of the year. The critical time of year varies with the species. For example, oakbrush is very difficult to burn when the leaves are green, but when its leaves are brown and still hanging on the branches, it becomes one of Colorado's most flammable fuels for 2 to 3 weeks in autumn." The key point here is that these highly flammable autumn conditions in oakbrush existed in the Battlement Creek drainage in mid-July due to the June 14 frost!

The report clearly described many of the events observed in the Battlement Creek Fire!

> "The "X" fuels support medium to high intensity fires, short-range spot fires are common, rate of spread is moderate to fast, flare-ups brief but common and hot, just-burned area is tenable by humans within about ¼ hour, the fire front is impassable. Brush fires seldom burn throughout the night and into the next day if suppression action is made.
>
> "The areas are of state interest due to the associated burning characteristics, the difficulty of fire suppression and the resultant dangers to life and property during special times. By their very nature "X" fuels often create a false sense of security due to their lush greenness and sometimes non-flammable periods. Many people find it impossible to believe the potential

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1/ Guidelines and Criteria for Wildfire Hazard Areas, Sept. 1974, Colorado State Forest Service, Fort Collins, Colorado.

> flammability until they witness burning in critical periods. Its (oakbrush) rate of fire spread has been observed and timed to be an incredible 16 acres per minute, steady for 3 hours, in Colorado! Fast running mule deer have been found dead in oakbrush burns--unable to outrun the fire's spread. Brush fires are very sensitive to wind direction. Property and lives considered safe on a flank can be quickly threatened within minutes by a wind shift."

So Colorado oakbrush need not be compared to California chaparral fuel types. Under the July conditions of frost-induced dieback in Gambel's oak in Battlement Creek, the oak stands on its own as a most potent fuel type!

Robert W. Mutch
Research Forester
Intermountain Forest and
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United States Department of the Interior

IN REPLY REFER TO

9210 (100)

BUREAU OF LAND MANAGEMENT

Boise Interagency Fire Center
3905 Vista Avenue
Boise, Idaho 83705

July 16, 1976

Memorandum

To: State Director, Colorado

From: BLM Director-BIFC

Subject: Evaluation of Fuels on the West Slope of Colorado

Subject to your request, I flew to your West Slope Fire Center at Grand Junction on July 14. There I met Byron Kropf and Doug Gregory of the Colorado State Office and Roy Johnson of the Grand Junction District. On July 15, Byron and I flew extensive areas by helicopter after having determined these were probably the more critical areas based on a fixed wing flight on July 14.

The imminent problem is caused by the fact that on June 14, 1976, a very hard killing frost occurred across most of the West Slope of Colorado. A temperature of 32° was recorded at Grand Junction, and Rifle recorded 28°. In the area above 7,000 feet, this temperature probably got down in the 24° range. The frost caught particularly the oak brush at a very vulnerable early leaf and bud stage. Above the 10,000 foot elevation, it appears the aspen was also heavily damaged. Above 8,500 feet, there is evidence of damage to the snowberry and mahogany.

The following details are essentially the observations that were made on the July 15 helicopter flight.

The helicopter flight took us southwest of Grand Junction to an area of a prior fire, "Granite Creek." We landed at the 8,000 foot level and examined the oak brush and snowberry stands. It appeared that 25 to 30 percent of the oak brush had been severely affected. On an individual plant basis, most of the secondary and tertiary branches were dead. The leaves were desiccated, and 90 percent had fallen to the ground. There was perhaps a two-inch ground cover in the thicker areas where the leaves had shed. Perhaps ten percent of the snowberry had been nipped and their leaves were like parchment. We dug into the oak root system and even the smaller feeder roots appeared to be alive. The 7,500 foot elevation seemed to be a critical level. The damaged areas exhibited no particular pattern in this area but did seem to follow

typical drainage flow channels. Pinon juniper exhibited a fairly solid canopy and was fairly dry for this time of year.

We then proceeded east of Gateway to the south of Montrose into the Powderhorn area. Here the frost damage was much more severe. Up to 80 percent of the area appeared affected. In this area generally, the oak leaves had not fallen from the trees. Time precluded spending much time in this area and we did not land, but I expect the individual plant situation would be similar to the Granite Creek fire area except that there may be some mortality in the primary stalks.

We then flew northward to an area perhaps 35 miles north of the Gunnison Gorge and proceeded westward into Grand Junction, flying south over Rifle and over the Book Cliffs area. The area around Rifle appears to be damaged at about the 50 percent level. I would liked to have gotten into the Douglas Pass area since there appeared to be considerable damage in that area.

There is a large area between 7,500 feet and 9,500 feet north of the Gunnison Gorge that is affected but of probably more concern to the Bureau of Land Management is the apparent damage to the lodgepole pine in draws feeding into the Gunnison Canyon Reservoir. Damage appears extensive on both sides of the reservoir and is either a very serious beetle infestation or a frost desiccation. While I expect this might be the "gray forest" stage in lodgepole pine, it needs to be field examined to determine if, in fact, these trees are dying and if so, then the field problem is greatly magnified.

Upon returning to Grand Junction, I made some cursory analysis of the long range situation. Most of the West Slope had a very mild winter. Two large April storms brought substantial moisture to the area and the Palmer Drought Index indicates very near to the normal range. Since May the area has had very limited moisture but this is not too abnormal. However, computer runs of the AFFIRMS program are showing some interesting comparisons. Comparative runs of the ignition index (which is a pretty good one for light fuels) shows readings that are consistently worse than those that have been recorded in the past. The same kind of comparisons for energy release indexes were indicating about the same thing.

From a fire standpoint, the West Slope Fire Center has been responding to about three times the normal number of fires, and in the 6,000 plus elevations, they have had difficulty with spotting in fairly sparse pinon juniper stands. At this time, they have not yet had a fire in the oak brush areas.

The State Office has caused a fair buildup in the initial attack capability with the view of getting the fires early. The basic strategy of the initial attack complement has been very effective so far. To date the initial attack crews have done an excellent job in coping with the overload fire situation.

Summary and Conclusions:

1. The West Slope of Colorado was subjected to an abnormal hard frost on June 14, 1976. It caught particularly the oak brush at a very vulnerable stage and has affected snowberry and mountain mahogany in the higher elevations.

2. Nature has provided an exceptionally rigorous pruning job to most of the affected plants. My cursory estimate on an individual plant basis is that, where affected, about 40 percent of the plant is damaged. In some areas the leaves have fallen to the ground; in other areas, this has not occurred. As long as the fuel is in the air, it is more dangerous from the ladder effect, but when it falls to the ground, there is a dangerous ground cover.

3. Much of the heavier fuels on BLM lands, pinon juniper in particular, is already dry. It is running about a month ahead of normal. The "pinon smell," which is an indicator of flashiness, has already been noted and, in fact, has been causing spot fires that normally should not occur in fairly sparse stands.

4. The West Slope of the Colorado is facing a very dangerous fire situation because of the extra volume of fuel and the drying conditions and the possibility for ladder effect, particularly in the oak brush areas. My sampling was of necessity very spotty and cursory and I could not assess potential wildlife or grazing implications but there is a very dangerous fire situation developing because of the added fuel load.

5. Of vital interest and concern to BLM but not a direct responsibility is the vast area of bug killed spruce and lodgepole now compounded by damage to the aspen and mountain brush encompassed a large area bounded roughly by a triangle involving Meeker, Kremmling and Delta and including the Gunnison River drainage. This would involve parts of the Routt, White River, and Uncompagre National Forests.

6. From a suppression standpoint, there is in place a reasonably strong initial attack force at Grand Junction. It is essentially, however, a "loaner" organization made up of USFS smoke jumpers, BIFC

personnel and aircraft, and Alamosa crews. There should be a regular complement to staff and manage this complex operation, particularly the air operation. A critical point to remember is that the worst of the fire season is yet to come. There is going to be a normal and continuing operation for the next few years and this force, in my view, is perhaps conservative. They may be faced with added fuel loading for several years which might need augmented support.

7. For this particular season, I would recommend that any fire that exceeds 50 acres in oak brush fuels is a potential project fire and assistance should be requested for any fires that exceed this limitation when containment has not been achieved by initial attack.

cc:
Mr. Max Peterson
USFS-USDA
Programs and Legislation
Washington, D.C.

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